National Aeronautics and Space Administration

Budget Estimates

FISCAL YEAR 1990

Volume II

Construction of Facilities

CONTENTS

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
CONSTRUCTION OF FACILITIES
FISCAL YEAR 1990 ESTIMATES

TABLE OF CONTENTS

VOLUME II

SUMMARY
INFORMATION

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

GENERAL STATEMENT

The Construction of Facilities (CoF) appropriation provides contractual services for the repair, rehabilitation and modification of existing facilities; the construction of new facilities and the acquisition of related facility equipment; environmental compliance activities; the design of facilities projects; and advance planning related to future facilities needs.

The funds requested for FY 1990 provide for continuing prior year endeavors to meet facilities requirements for the Space Station Freedom and Space Flight Programs; construction of new facilities needed to support science, space technology and aeronnutical research; continuation of the multi-year effort to restore and modernize NASA's aeronautical research and development facilities; repair, rehabilitation and modification of other facilities to maintain, upgrade and improve the usefulness of the NASA physical plant; minor construction of new facilities, facility planning and design activities, and environmental compliance and restoration.

The projects and amounts in the budget estimates reflect Space Station Freedom and Space Flight requirements that are time-sensitive to meet specific program objectives. Other program requirements for 1990 include refurbishing bridges, Merritt Island, and rehabilitation of the Spacecraft Assembly and Encapsulation Facility II at the Kennedy Space Center, rehabilitation of the central heating/cooling plant at the Johnson Space Center, construction of a Data Operations Facility and a Quality Assurance and Detector Development Laboratory at the Goddard Space Flight Center, modernization of the south utility systems at the Jet Propulsion Laboratory, projects to repair, restore, and modernize NASA's aeronautical research and development facilities at Ames, Lewis, and Langley Research Centers, and at the Plum Brook Station, construction of an Automation Sciences Research Facility at the Ames Research Center, construction of a Supersonic/Hypersonic Low Disturbance Tunnel at the Langley Research Center, and modifications for seismic safety, Goldstone, California.

The FY 1990 program continues to meet the objectives of preserving and enhancing the capabilities and usefulness of existing facilities and ensuring safe, economical and efficient use of the NASA physical plant. This request continues the necessary rehabilitation and modification program begun in prior years and continues a repair program. The repair program restores facilities to a condition substantially equivalent to their originally designed capability. The minor construction program continues to provide a means to accomplish smaller facility projects which accommodate changes in technical and institutional requirements. The environmental compliance and restoration program ensures that statutory environmental requirements are met and any necessary remedial action promptly taken.

Funds requested for facility planning and design cover advance planning and design requirements for potential future projects, master planning, facilities studies, engineering reports and studies and the preparation of facility project design drawings and bid specifications.

The FY 1989 CoF Program includes $15,000,000 transferred from DOD to NASA for initiation of design and construction of a component and subsystem test facility at the Stennis Space Center to support the Advanced Launch System.

The budget authority requested for FY 1990 is $341,800,000, with estimated outlays of $237,118,000.

In addition to the above, four projects are proposed for private sector financing and are described in the addendum to this budget submission. These projects are the Advanced Solid Rocket Motor production and test facility, Yellow Creek, Mississippi, the Space Station Processing Facility at the Kennedy Space Center, the Neutral Buoyancy laboratory at the Johnson Space Center, and the Observational Instruments Laboratory at the Jet Propulsion Laboratory. The projects selected for privatization are functionally suitable for processing, developing, or manufacturing commercial space products as well as directly supporting NASA programs. Economic analyses show that priviatization is cost beneficial to the Government, provided the proposer retains 20 percent or more ownership of the facilities. It also precludes large outlays by the Government in FY 1990 and FY 1991.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

PROPOSED APPROPRIATION LANGUAGE

CONSTRUCTION OF FACILITIES

For construction, repair. rehabilitation and modification of facilities, minor construction of new facilities and additions to existing facilities, and for facility planning and design not otherwise provided. for tho National Aeronautics m d Space Administration. and for the acquisition or condemnation of real property, as authorized by law, [$270,100,000] *$341,800,000*, to remain available until September SO, [1991] *1992*: *Provided*, That, notwithstanding the limitation on the availability of funds appropriated under this heading by thu appropriations *Act*, when nny activity her been initiated by the incurrence of obligations therefor, the amount available for such activity shall remain available until expended, except that this provision shall not apply to the amounts appropriated pursuant to the authorization for repair, rehabilitation and modification of facilities, minor construction of new facilities and additions to existing facilities, and facility planning and design: *Provided further*, That no amount appropriated pursuant to this or any other Act may be used for the lease or construction of a new contractor-funded facility for exclusive use in support of a contract or contracts with the National Aeronautics and Space Administration under which the Administration would be required to substantially amortize through payment or reimbursement such contractor investment, unless an appropriations Act specifies the lease *or* contract pursuant to which such facilities are to be constructed or leased or such facility is otherwise identified in ruch Act: *Provided* further. That the Administrator may authorize such facility lease or construction, *if* he determines, *in* consultation with the Cummittees on Appropriations. that deferral of such action until the enactment of the next appropriations Act would be inconsistent with the interest of the Nation in aeronautical and space activities [: *Provided* further, That in addition to sums otherwise provided by this paragraph. an additional $20,000,000, to remain available until expended: *Provided further*, That up to $90,000,000 of the funds provided by this paragraph may be transferred to and merged with sums appropriated for "Research and development" and/or "Research and program management"]. *(Department of Housing and Urban Development-Independent Agencies Appropriations Act, 1989; additional authorizing legislation to be proposed.)*

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
CONSTRUCTION OF FACILITIES
FISCAL YEAR 1990 ESTIMATES

SUMMARY OF THE BUDGET PLAN BY LOCATION

(Thousands of Dollars)

LOCATION	Fiscal Year 1988	Fiscal Year 1989	Fiscal Year 1990 Agency Request
Space Station Freedom Facilities	---	---	38,100
Space Flight Facilities	17,200	58,400	53,400
Advanced Launch System Facilities	---	15,000	---
George C. Marshall Space Flight Center	---	11,400	---
John F. Kennedy Space Center	---	---	8,000
Lyndon B. Johnson Space Center	---	7,800	2,800
Goddard Space Flight Center	8,600	3,100	19,500
Jet Propulsion Laboratory	---	---	5,400
Aeronautical Facilities Revitalization	16,000	52,500	64,200
Ames Research Center	---	---	10,600
Dryden Flight Research Facility	10,500	---	---
Langley Research Center	---	---	6,900
Lewis Research Center	16,300	---	---
Various Locations	6,400	---	2,600
Repair	24,400	24,900	28,000
Rehabilitation and Modification	30,972	32,000	36,000
Minor Construction	8,000	9,000	10,000
Facility Planning and Design	16,000	20,000	26,300
Environmental Compliance and Restoration	23,900	26,000	30,000
Total Plan	178,272	260,100 *	341,800

* Excludes $15,000,000 appropriated to Construction of Facilities for transfer to the Science, Space, and Technology Education Trust Fund.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
CONSTRUCTION OF FACILITIES
FISCAL YEAR 1990 ESTIMATES

SUMMARY OF BUDGET PLAN BY COGNIZANT OFFICE

(Thousands of dollars)

	Fiscal Year FY 1988	Fiscal Year FY 1989	Fiscal Year 1990 Agency Request
Office of Space Station	--	...	38,100
Office of Space Flight	17,200	81,200	64,200
Office of Space Science and Applications	8,600	14,500	12,900
Office of Aeronautics and Space Technology	42,800	52,500	81,700
Office of Space Operations	6,400	...	14,600
Office of Management	103,272	111,900	130,300
Total Plan	178,272	260,100 *	341,800

SUMMARY OF BUDGET PLAN BY SUBFUNCTION

(Thousands of dollars)

Code				
253	Space Flight	17,200	73,400	91,500
254	Space Science, Applications and Technology	8,600	11,400	21,600
255	Supporting Space Activities	109,672	122,800	157,600
(250)	(Subtotal, General Science, Space and Technology)	(135,472)	(207,600)	(270,700)
402	Air Transportation	42,800	52,500	71,100
	Total Plan	178,272	260,100 *	341,800

* Excludes $15,000,000 appropriated to Construction of Facilities for transfer to the Science, Space, and Technology Education Trust Fund.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
CONSTRUCTION OF FACILITIES
FISCAL YEAR 1990 ESTIMATES
BUDGET PLAN BY LOCATION AND PROJECT
(Thousands of Dollars)

CO	BA	SF	INSTALLATION AND PROJECT	Fiscal Year 1988	Fiscal Year 1989	FY 1990 Agency Request	Page No.
			SPACE STATION FREEDOM FACILITIES AT VARIOUS LOCATIONS:	...	...	38,100	
SS	1	253	Construction of Addition for Space Systems Automated Integration and Assembly Facility (JSC)	...	...	10,500	CF 1-1
SS	1	253	Construction of Addition to Mission Control Center (JSC)	...	...	17,800	CF 1-8
SS	1	253	Construction of Addition to Simulator/Training Facility (JSC)	---	...	3,800	CF 1-14
SS	1	253	Modifications for Expanded Solar Simulation (JSC)	...	...	2,000	CF 1-22
SS	1	253	Modifications of Process Technology Facility for Space Station (MSPC)	---	...	4,000	CF 1-30
			SPACE FLIGHT FACILITIES AT VARIOUS LOCATIONS:	17,200	58,400	53,400	
SF	1	253	Replace Cooling Towers, Launch Complex 39 Utility Annex (KSC)	...	...	4,600	CF 2-1
SF	1	253	Replace Launch Complex 39, Pad A Chillers and Controls (KSC)			1,200	CF 2-7
SP	1	253	Replace Roofs, Launch Complex 39 (KSC)	---	...	11,000	CF 2-13
SP	1	253	Replace Vehicle Assembly Building Air Handling Units (KSC)	---	...	1,800	CF 2-20
SP	1	253	Upgrade orbiter Modification and Refurbishment Facility to Orbiter Processing Facility #3 (KSC)	...	...	26,000	CF 2-26
SP	1	253	Modification of High Pressure Industrial Water System (SSC)	...	...	2,000	CF 2-34
SP	1	253	Replacement of High Pressure Gas Storage Vessels (SSC)	---	3,500	3,000	CF 2-39
SP	1	253	Construction of National Resource Protection (Var. Locations)	---	2,600	3,800	CF 2-44
SF	1	253	Construction of Advanced Solid Rocket Motor (ASRH) Production and Test Facility (MSPC)	---	27,000	---	
SF	1	253	Refurbish Atmospheric Reentry Materials and Structures Evaluation Facility (JSC)	...	4,900	...	
SF	1	253	Increase Chiller Capacity, LC-39 Utility Annex (KSC)	---	2,300	---	
SF	1	253	Rehabilitation of PAD A, Launch Complex 39 (KSC)	---	4,600	...	
SP	1	253	Modifications for Advanced Engine Development, Test Stand 116 (MSFC)	---	13,500	---	
SF	1	253	Construction of LC-39 Operations Support Building (KSC)	17,200	---	---	

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
CONSTRUCTION OF FACILITIES
FISCAL YEAR 1990 ESTIMATES
<u>BUDGET PLAN BY LOCATION AND PROJECT</u>
(Thousands of Dollars)

CO	BA	SF	INSTALLATION AND PROJECT	Fiscal Year 1988	Fiscal Year 1989	FY 1990 Agency Request	Page No.
			ADVANCED LAUNCH SYSTEM FACILITIES:	---	15,000	---	
SF	1	253	Construction of Component and Subsystem Development Test Facility (SSC)	---	15,000 *	---	
			JOHN F. KENNEDY SPACE CENTER	---	---	8,000	
SF	7	254	Refurbish Bridges, Merritt Island	---	---	4,500	CF 3-1
SF	2	254	Rehabilitation of Spacecraft Assembly and Encapsulation Facility II	---	---	3,500	CF 3-6
			LYNDON B. JOHNSON SPACE CENTER	---	7,800	2,800	
SF	7	255	Rehabilitation of Central Heating/Cooling Plant	---	---	2,800	CF 4-1
SF	7	255	Construction of Auxiliary Chiller Facility	---	7,800	---	
			MARSHALL SPACE FLIGHT CENTER	---	11,400	---	
SSA	2	254	Modifications to the X-Ray Calibration Facility (XRCF)	---	11,400	---	
			GODDARD SPACE FLIGHT CENTER	8,600	3,100	19,500	
SO	7	255	Construction of Data Operations Facility	---	---	12,000	CF 5-1
SSA	2	254	Construction of Quality Assurance and Detector Development Laboratory	---	---	7,500	CF 5-6
SSA	7	255	Modifications for Utility Reliability	---	3,100	---	
SSA	2	254	Construction of Spacecraft Systems Development and Integration Facility	8,600	---	---	
			JET PROPULSION LABORATORY	---	---	5,400	
SSA	7	255	Modernization of South Utility Systems	---	---	5,400	CF 6-1

* Transferred from DOD to NASA for initiation of design and construction.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
CONSTRUCTION OF FACILITIES
FISCAL YEAR 1990 ESTIMATES
BUDGET PLAN BY LOCATION AND PROJECT
(Thousands of Dollars)

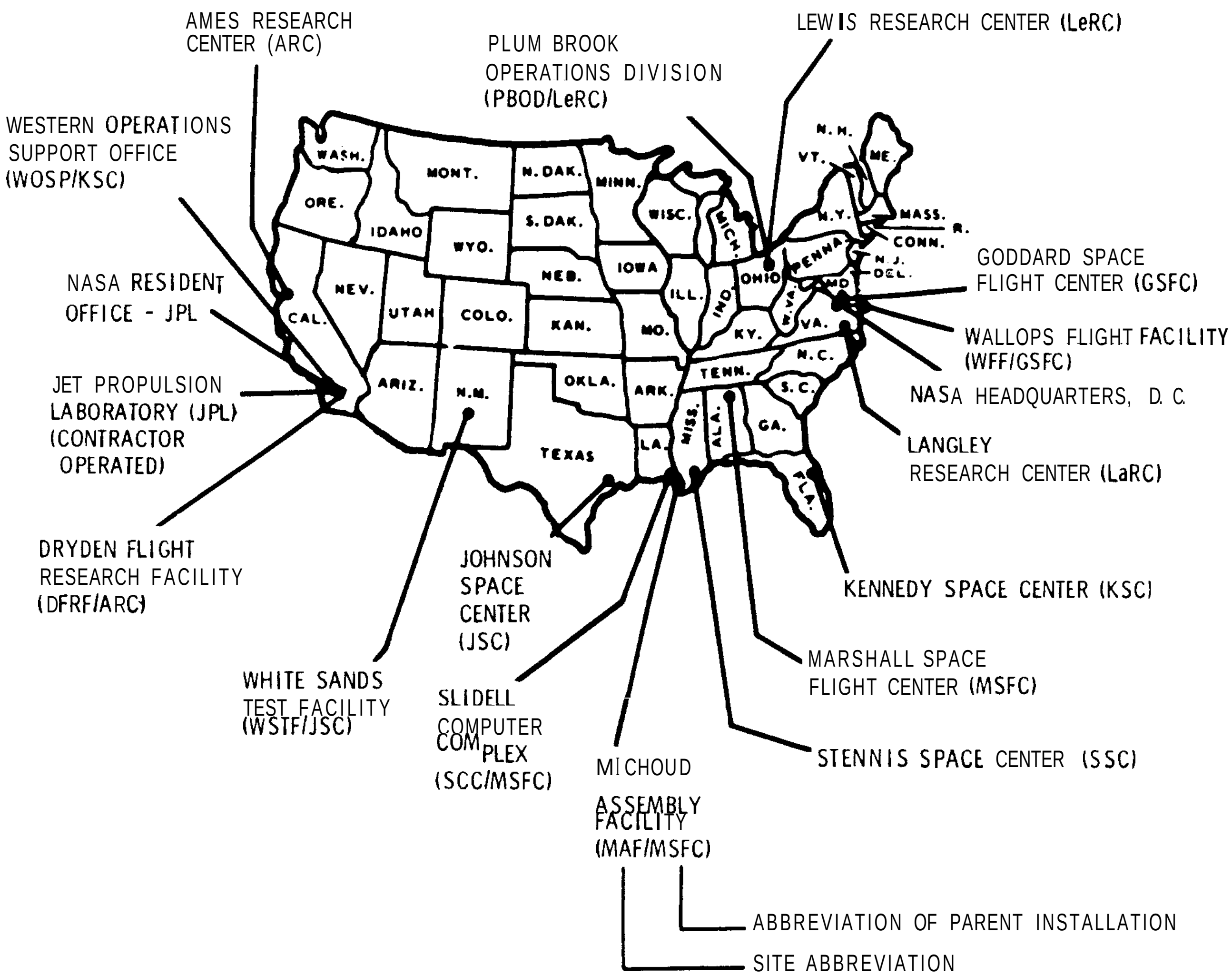
CO BA SF	INSTALLATION AND PROJECT	Fiscal Year 1988	Fiscal Year 1989	FY 1990 Agency Request	Page No.
	AERONAUTICAL FACILITIES REVITALIZATION AT VARIOUS LOCATIONS:	16,000	52,500	64,200	
AST 5 402	Construction of 40x80 Drive Motor Roof (ARC)	---	---	1,000	CF 7-1
AST 5 402	Modifications to Thermo-Physics Facilities (ARC)	---	---	4,600	CF 7-6
AST 5 402	Modifications to 14X22 Subsonic Wind Tunnel (LaRC)	---	---	1,000	CF 7-10
AST 5 402	Modifications to National Transonic Facility for Productivity (LaRC)	---	---	7,600	CF 7-15
AST 5 402	Modifications to 20-Foot Vertical Spin Tunnel (LaRC)	---	---	1,900	CF 7-20
AST 5 402	Rehabilitation of Central Air System (LeRC)	---	---	2,400	CF 7-25
AST 5 402	Rehabilitation of Central Refrigeration Equipment (LeRC)	---	---	7,200	CF 7-31
AST 5 402	Rehabilitation of 8X6 Supersonic and 9X15 Low-Speed Wind Tunnels (LeRC)	---	---	6,800	CF 7-36
AST 5 402	Rehabilitation of Hypersonic Tunnel (Plum Brook)	---	---	4,100	CF 7-41
AST 5 402	Repair and Modernization of the 12-Foot Pressure Wind Tunnel (ARC)	16,000	25,200	27,600	CF 7-46
AST 5 402	Refurbishment of Hypersonic Facilities Complex (LaRC)	---	12,800	---	
AST 5 402	Rehabilitation and Modifications to 10X10 Supersonic Wind Tunnel (LeRC)	---	14,500	---	
	AMES RESEARCH CENTER	---	---	10,600	
AST 4 254	Construction of Automation Sciences Research Facility	---	---	10,600	CF 8-1
	DRYDEN FLIGHT RESEARCH FACILITY	10,500	---	---	
AST 5 402	Construction of Integrated Test Facility	10,500	---	---	
	LANGLEY RESEARCH CENTER	---	---	6,900	
AST 5 402	Construction of Supersonic/Hypersonic Low Disturbance Tunnel	---	---	6,900	CF 9-1
	LEWIS RESEARCH CENTER	16,300	---	---	
AST 5 402	Construction of Addition to the Research Analysis Center				
AST 5 402	Modifications for Fan/Compressor Research, Engine	9,800	---	---	
	Research Building	6,500	---	---	

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
CONSTRUCTION OF FACILITIES
FISCAL YEAR 1990 ESTIMATES
BUDGET PLAN BY LOCATION AND PROJECT
(Thousands of Dollars)

CO	BA	SF	INSTALLATION AND PROJECT	Fiscal Year 1988	Fiscal Year 1989	FY 1990 Agency Request	Page No.
			VARIOUS LOCATIONS	6,400	...	2,600	
SO	7	255	Modifications for Seismic Safety, Goldstone, CA (JPL)	...	...	2,600	CF 10-1
SO	7	255	Construction of Communications Development Antenna, Goldstone, CA (JPL)	6,400	...	...	
MGT	7	255	REPAIR OF FACILITIES AT VARIOUS LOCATIONS, NOT IN EXCESS OF $750,000 PER PROJECT......	24,400	24,900	28,000	CF 11-1
MGT	7	255	REHABILITATION AND MODIFICATION OF FACILITIES AT VARIOUS LOCATIONS NOT IN EXCESS OF $750,000 PER PROJECT...........	30,972	32,000	36,000	CF 12-1
MGT	7	255	MINOR CONSTRUCTION OF NEW FACILITIES AND ADDITIONS TO EXISTING FACILITIES AT VARIOUS LOCATIONS, NOT IN EXCESS OF $500,000 PER PROJECT....	8,000	9,000	10,000	CF 13-1
MGT	7	255	FACILITY PLANNING AND DESIGN..	16,000	20,000	26,300	CF 14-1
			SUBTOTAL, CONSTRUCTION..........................	154,372	234,100	311,800	
MGT	7	255	ENVIRONMENTAL COMPLIANCE AND RESTORATION PROGRAM..........	23,900	26,000	30,000	CF 15-1
			TOTAL, CONSTRUCTION OF FACILITIES..................	**178,272**	**260,100 ***	**341,800**	

* Excludes $15,000,000 appropriated to Construction of Facilities for transfer to the Science. Space, and Technology Education Trust Fund.

LOCATION OF MAJOR AND COMPONENT INSTALLATIONS



RECORDED VALUE OF CAPITAL TYPE PROPERTY
IN-HOUSE AND CONTRACTOR-HELD
AS OF SEPTEMBER 30, 1988
(DOLLARS IN THOUSANDS)

	REAL PROPERTY					OTHER		
REPORTING INSTALLATION	LAND	BUILDING	OTHER STRUCTURES AND FACILITIES	LEASEHOLD IMPROVEMENTS	TOTAL	EQUIPMENT	FIXED ASSETS IN PROGRESS	GRAND TOTAL
AMES RESEARCH CENTER	2929	424012	29303	0	456244	340915	110039	975258
ARC MOFFETT FIELD, CA	2928	400240	14396	0	417164	245153	152445	815762
DRYDEN FLIGHT FACILITY EDWARDS, CA	0	23076	14560	0	31636	11341	17594	132511
VARIOUS LOCATIONS	1	696	341	0	1044	25881		26925
GODDARD SPACE FLIGHT CENTER	2856	166424	111231	0	286517	458185	75318	120020
GSFC - GREENBELT, MD	1361	111413	19524	0	132298	234355	62760	429413
TRACKING STATIONS NETWORK	5	11348	24646	0	35999	123588	3556	163143
WFF - WALLOPS ISLAND, VA	1490	42982	69291	0	113163	56609	9002	119374
VARIOUS LOCATIONS	0	681	3776	0	4457	43633	0	48090
JET PROPULSION LABORATORY	1188	122092	09061	1929	215076	376211	96833	688100
JPL - PASADENA, CA	1188	109149	11196	1922	130651	298417	96833	525905
DEEP SPACE NETWORK	0	12343	72071	1	84421	77854	0	162275
JOHNSON SPACE CENTER	10883	224431	81120	105	316545	441149	16706	180400
JSC - HOUSTON, TX	7313	184155	49948	0	241416	280575	16706	538697
WHITE SANDS TEST FACILITY LOS CRUCES, NM	0	10302	25601	105	36008	23961	0	59969
VARIOUS LOCATIONS	3570	29900	5571	0	39121	142613	0	181734
KENNEDY SPACE CENTER	11345	526623	518283	0	1116251	623810	23797	1763918
KSC - CAPE CANAVERAL, FL	11345	526623	518283	0	1116251	86974	23791	1221022
WESTERN TEST RANGE, LOMPAC, CA	0	0	0	0	0	92586	0	92586
VARIOUS LOCATIONS	0	0	0	0	0	444310	0	444310
LANGELY RESEARCH CENTER	156	182064	37015V	0	552379	205899	27780	786058
LARC - HAMPTON, VA	156	102064	370159	0	552379	192458	21180	112611
VARIOUS LOCATIONS		0	0	0	0	13441	a	13441
LEWIS RESEARCH CENTER	2621	235953	01960	136	326610	163611	54510	544797
LERC - CLEVELAND, OH	316	159546	68890	136	228896	138916	54510	422322
PLUMBROOK, SANDUSKY, OH	2305	76401	19062	0	97774	6932	0	104106
VARIOUS LOCATIONS	0	0	0	I	0	17769	0	17769
MARSHALL SPACE FLIGHT CENTER	1171	297646	154213	0	459030	493184	2690	955504
MSFC - HUNTSVILLE, AL	0	135456	10036	0	205492	311520	2690	519702
MICHOUD ASSEMBLY FACLITY, AL	7102	152120	11322	0	230544	64499	0	295043
SLIDELL COMPUTER COMPLEX, AL	69	5242	2538	0	7849	6674	0	14523
VARIOUS LOCATIONS	0	4028	10311	0	15145	111091	0	126236
STENNIS SPACE CENTER	18061	102344	200955	I	321360	29876	0	351236
STENNIS SPACE CENTER	18061	102344	200955	0	321361	29876	0	351236
VARIOUS LOCATIONS	0	0	0	0	0	0	0	0
NASA HEADQUARTERS	0	0	0	0	0	39378	0	39378
NASA - HQS, WASH., D.C.	0	0	0	0	0	15496	0	15496
VARIOUS LOCATIONS	0	0	0	0	0	23882	0	23882
AGENCY TOTAL	117210	2281595	1649097	2170	4050072	3187004	467673	7704749

JUSTIFICATION
BY LOCATION

SPACE STATION
FACILITIES

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1990 ESTIMATES

SUMMARY

SPACE STATION FREEDOM FACILITIES

	Amount	Page No.
Office of Space Station:		
Construction of Addition for Space Systems Automated Integration and Assembly Facility, Johnson Space Center	10,500,000	CF 1-1
Construction of Addition to Mission Control Center, Johnson Space Center	17,800,000	CF 1-8
Construction of Addition to Simulator/Training Facility, Johnson Space Center	3,800,000	CF 1-14
Modifications for Expanded Solar Simulation, Johnson Space Center	2,000,000	CF 1-22
Modifications of Process Technology Facility for Space Station, Marshall Space Flight Center	4,000,000	CF 1-30
Total	38,100,000	

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1990 ESTIMATES

PROJECT TITLE: Construction of Addition for Space Systems Automated Integration and Assembly Facility

INSTALLATION: Lyndon B. Johnson Space Center

FY 1990 CoF Estimate: $10,500,000

LOCATION OF PROJECT: Houston, Harris County, Texas

COGNIZANT HEADQUARTERS OFFICE: Office of Space Station

FY 1989 AND PRIOR YEARS' FUNDING: The following prior years' funding is related to this project:

	Planning and Design	Construction	Total
Specific CoF Funding	$698,000	---	$ 698,000
Capitalized Investment	---	$5,309,549	5,309,549
Total	$698,000	$5,309,549	$6,007,549

SUMMARY PURPOSE AND SCOPE:

This project provides for construction of an addition to the east end of the Systems Integration and Mockup Laboratory of Building 9 to support development, testing and flight qualification of integrated component assembly/attachment hardware and other mechanisms for the Space Station structural assembly and integration. This proposed addition, comprised of approximately 21,000 square feet (sq. ft.) of high-bay area and approximately 26,000 sq. ft. of laboratory support area, will accommodate simulators, associated support equipment and provide space for personnel in automated systems development.

PROJECT JUSTIFICATION:

This project will provide an area for high-fidelity dynamics simulation testing of manual and automated construction techniques and hardware, component attachment methods, and verification/inspection techniques for on-orbit Space Station structural assembly tasks and similar applications. The high-bay addition will accommodate several six-degree-of-freedom simulators, a 40-foot by 40-foot air-bearing floor, and static test area for various Space Station structures, components and test fixtures. The three-story laboratory support addition is required for associated technician work and staging, test and applications computing support, techniques development laboratories, transient engineering support space and mechanical equipment. As an addition to the integration and mockup area supporting Space Shuttle and Space Station, the new area will benefit from shared accessibility, experience, techniques, support personnel, and special facilities. Enlargement of the existing air-bearing floor is required to accommodate full-scale dynamics tests utilizing the Shuttle and Space Station remote manipulator system already established/planned for this location. Accomplishment of Johnson Space Center (JSC) responsibilities for engineering and integrated ground verification prior to flight requires the capabilities provided by this project. This building addition is the most cost-effective means for meeting these requirements. These capabilities must be provided to verify on-orbit assembly methods and procedures.

IMPACT OF DELAY:

If the project is not approved, JSC will not be able to conduct the Space Station systems engineering and integration activities that are required to support proof-of-concept evaluation and end-to-end certification testing. Existing facilities are inadequate for meeting these mandatory verification and validation requirements.

PROJECT DESCRIPTION:

This project provides for construction of an addition to the east end of the Systems Integration and Mockup Laboratory of Building 9 consisting of approximately 47,000 sq. ft. The addition includes a 21,000-sq.-ft. high-bay area and a 26,000-sq.-ft. three-story laboratory support area. The project also provides for increasing the existing air-bearing surface area in the Systems Integration and Mockup Laboratory by 3,000 sq. ft. and providing 1,600 sq. ft. of air-bearing surface in the new high-bay area. Additionally, the project includes extending the existing high-bay bridge crane; installing an elevator in the laboratory support area; connecting to the JSC utility tunnel systems, electrical power, and air-conditioning. A paved parking lot for approximately 60 vehicles will be provided to support building personnel and replace parking spaces lost by construction of the addition.

PROJECT COST ESTIMATE:

The cost estimate is based on a preliminary engineering report and an in-house estimate.

	Unit of Measure	Quantity	Unit cost	cost
Land Acquisition	--	--	--	--
Construction	--	--	--	$10,500,000
Utilities, Utility Relocation, Landscaping, Tunnel Extension, Paving, Sidewalks, and Parking Lot	LS	--	--	597,000
Building High-Bay Addition:				
Architectural	SF	21,000	$ 47.48	997,000
Structural	SF	21,000	106.91	2,245,000
Mechanical	SF	21,000	30.71	645,000
Electrical	SF	21,000	13.33	280,000
Office and Laboratory Addition:				
Architectural	SF	26,000	22.77	592,000
Structural	SF	26,000	60.15	1,564,000
Mechanical	SF	26,000	60.15	1,564,000
Electrical	SF	26,000	49.62	1,290,000
Air-Bearing Floor and Structural Modifications	SF	4,600	157.83	726,000
Equipment	--	--	--	--
Fallout Shelter (not feasible)	--	--	--	--
Total				$10,500,000

LIST OF RELATED GRAPHICS:

Figure 1 - Location Plan
Figure 2 - Building Perspective
Figure 3 - First Floor Plan

OTHER EQUIPMENT SUMMARY:

Equipment such as computer systems, six-degree-of-freedom motion simulators and other instrumentation and test equipment totaling approximately $12,050,000 will be purchased from Research and Development (R&D) resources.

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

At the present time there are no requirements for future CoF funding.

LYNDON B. JOHNSON SPACE CENTER
FISCAL YEAR 1990 ESTIMATES
ADDITION FOR SPACE SYSTEMS AUTOMATED INTEGRATION
AND ASSEMBLY FACILITY

LOCATION PLAN

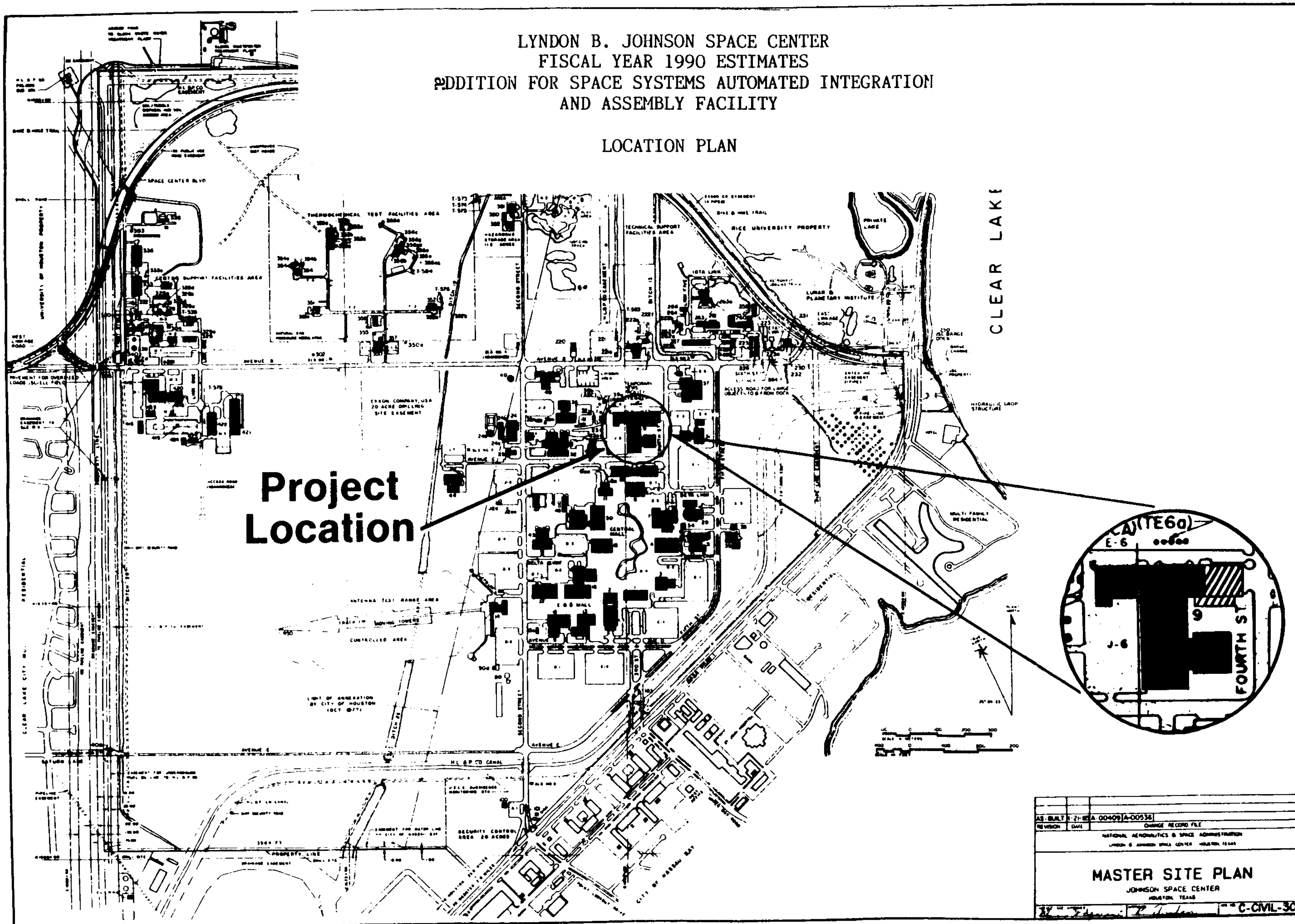
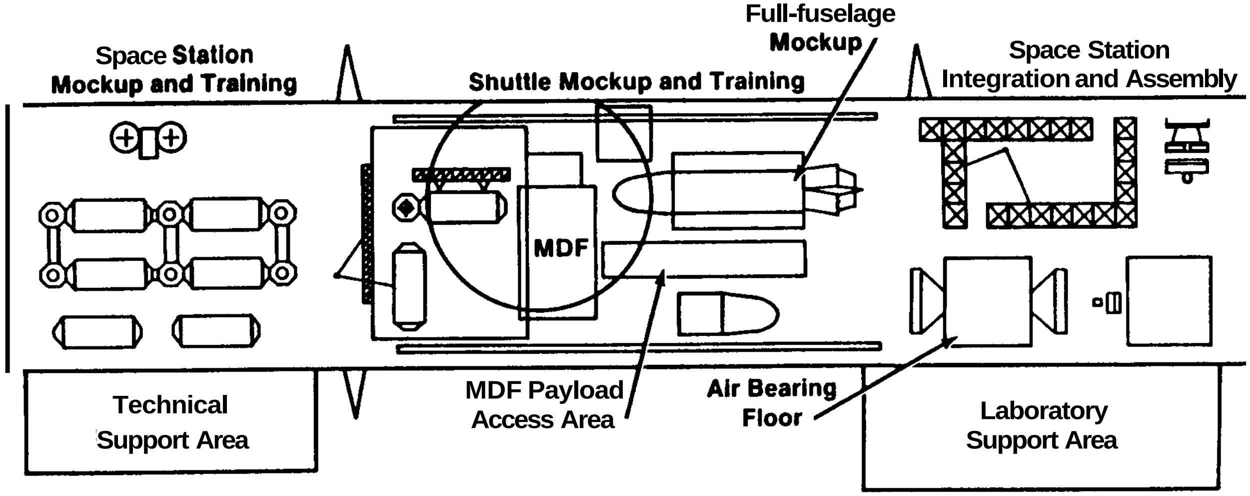
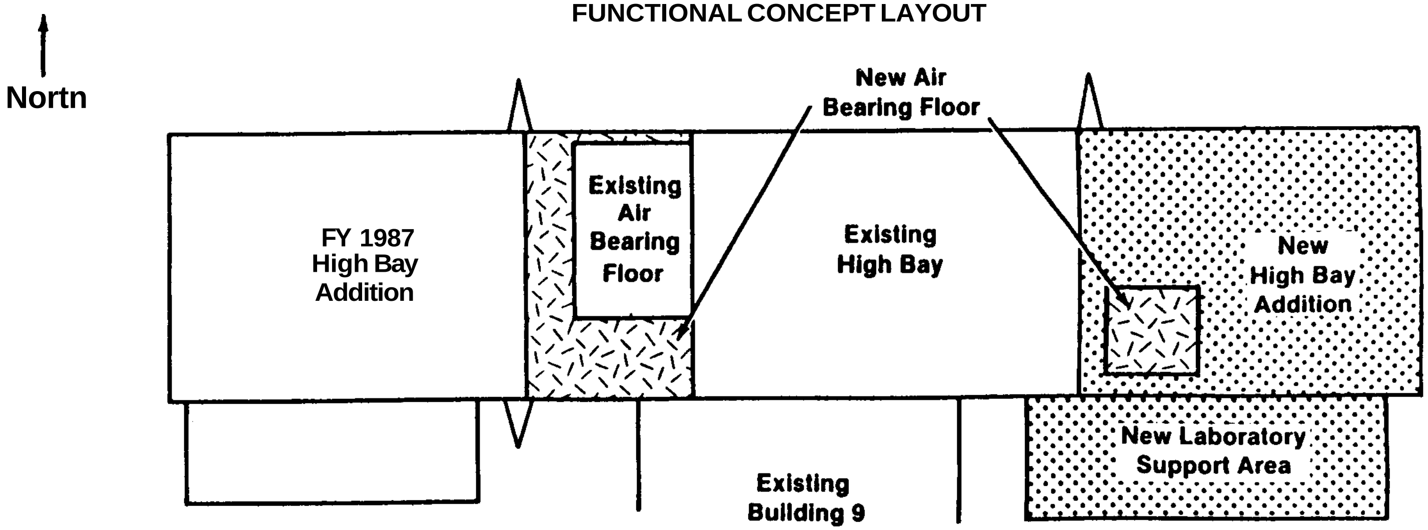


FIGURE 1

Addition for Space Systems Automated Integration and Assembly Facility



FUNCTIONAL CONCEPT LAYOUT



LAYOUT OF ADDITIONS BY FISCAL YEAR

FLOOR PLAN
FIGURE 2

Lyndon B. Johnson Space Center
Fiscal Year 1990 Estimates
Addition for Space Systems Automated Integration
and Assembly Facility
PERSPECTIVE

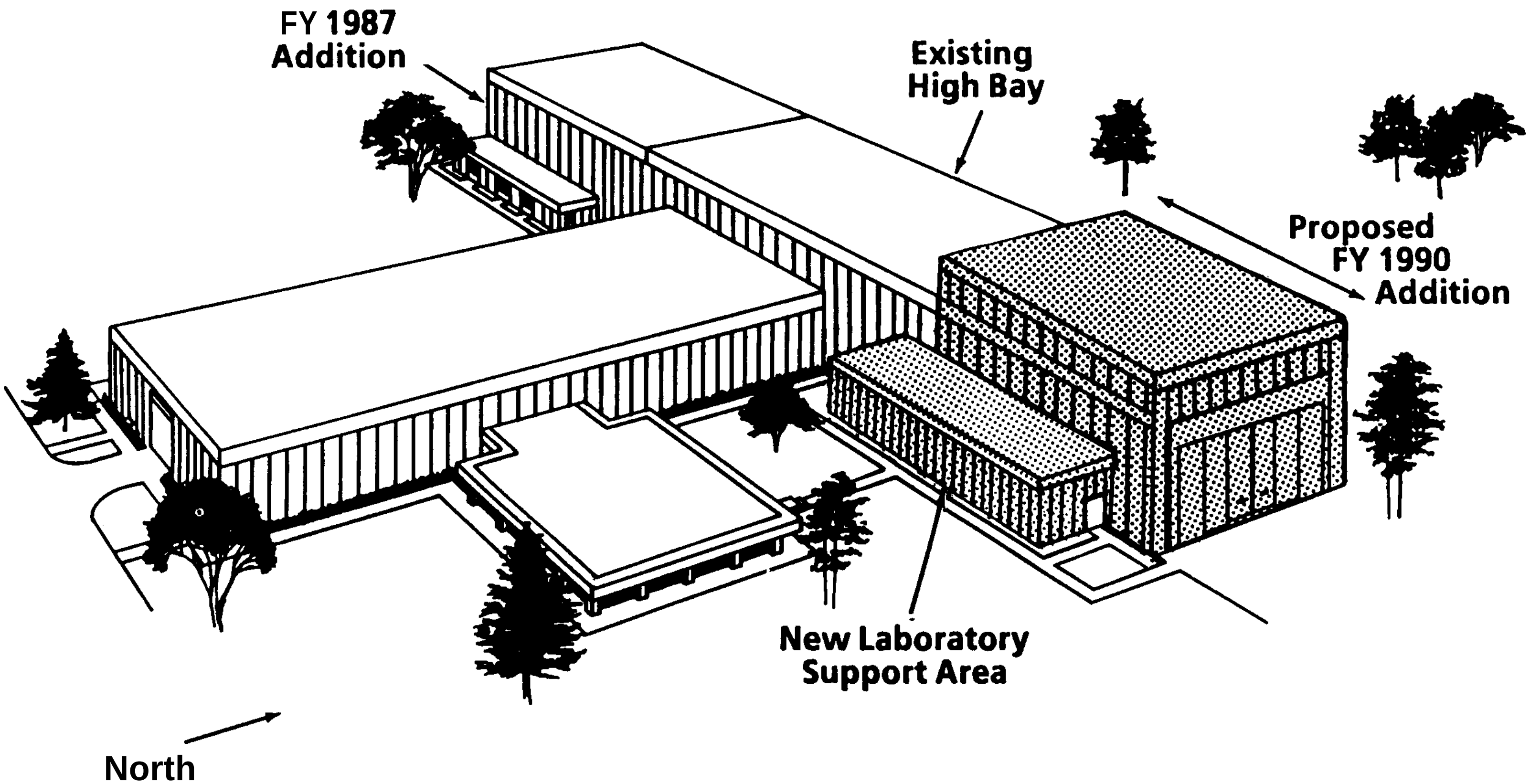


FIGURE 3

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1990 ESTIMATES

PROJECT TITLE: Construction of Addition to Mission Control Center

INSTALLATION: Lyndon B. Johnson Space Center

FY 1990 CoF Estimate: $17,800,000

LOCATION OF PROJECT: Houston, Harris County, Texas

COGNIZANT HEADQUARTERS OFFICE: Office of Space Station

FY 1989 AND PRIOR YEARS' FUNDING: The following prior years' funding is related to this project:

	Planning and Design	Construction	Total
Specific CoF Funding......................	$1,396,000	---	$ 1,396,000
Capitalized Investment...................	---	$14,426,962	14,426,962
Total..................................	$1,396,000	$14,426,962	$15,822,962

SUMMARY PURPOSE AND SCOPE:

This project provides for construction of an addition to the existing Mission Control Center (MCC), Building 30, mission operations wing (MOW). This five-story addition with a second-floor mezzanine, will provide the space required to accommodate various ground-based automatic data processing (ADP) equipment and associated systems to support Space Station operations.

PROJECT JUSTIFICATION:

This project is required to provide space for the initial and continuing basic ground support of the Space Station orbital assembly. Beginning with the first element launch, the facility will be required for support of real-time, near-real-time, and follow-on operations management, engineering analyses, contingency planning/operations and logistics coordination/management for the life of the Space Station program. The facility must be fully operational prior to first element launch with sufficient time provided for systems installation, activation. testing and verification of procedures.

The Space Station Control Center (SSCC) is required for Space Station operations. Proximity with the existing MCC is required for sharing of common skills, personnel, equipment, communications and data. Engineering and maintenance tasks will be shared with Space Transportation System (STS) programs. The MCC will remain configured for and dedicated to STS operations planned through the 1990's. Limited sharing of MCC areas will be possible, however, the STS mission support rate, manpower, equipment severe requirements in the MCC make it unsuitable and unavailable for use as the SSCC.

This addition provides the needed operations and associated equipment areas required for the continuous support of the Space Station. Operations management, support, planning, evaluation and simulation areas are included. It is anticipated that up to 55 civil service and 190 contractor personnel on a prime shift will be in the facility during Space Station operations; and two and one-half times this number is anticipated during anomalies and emergency operations. The facility will be used 24 hours a day. It is therefore essential that this facility be constructed.

IMPACT OF DELAY:

If this project is not approved, there will not be adequate space at Johnson Space Center (JSC) to establish and operate the SSCC. Systems installation/activation and operations procedures development and verification requirements prior to first element launch require this facility to be on line and operational well in advance of the first assembly activities.

PROJECT DESCRIPTION:

This project provides for construction of a five-story addition with a second-floor mezzanine at the southwest corner of the existing MCC, Building 30, MOW. The addition will consist of approximately 106,000 square feet for Space Station operations support and data processing/storage. Included in this project will be air-conditioning and heating; fire detection, alarm, and suppression systems; electrical power; and lighting as required for the various areas. Also included will be raised flooring and air-conditioning required by the computer equipment. Various existing underground utilities will be relocated and new storm drainage, sanitary sewer and water lines will be connected to existing-site systems to serve the new addition. Areas will also be provided for visitor access and viewing, rest rooms, corridors, stairways, elevators and mechanical/electrical room facilities. An existing paved service drive, located on the west side of the MOW, will be reconfigured for access to the addition. A loading dock, pedestrian walkways and a paved parking area also will be provided.

PROJECT COST ESTIMATE:

This cost estimate is based on 90-percent design completion.

	Unit of Measure	Quantity	Unit cost	cost
Land Acquisition	--	--	--	--
Construction	--	--	--	$17,800,000
Site Preparation:				
Parking Lot	LS	--	--	$ 225,000
15-kv Unit Substations (12)	LS	--	--	636,000
Utilities Modifications and Relocations; Concrete Walks and Asphalt Driveway	LS	--	--	86,000
Utility Tunnel	LS	--	--	91,000
Modification to Existing Building:				
Architectural and Structural	LS	--	--	7,000
Mechanical	LS	--	--	7,000
New Addition:				
Structural	SF	106.000	$28.25	2,995,000
Architectural	SF	106,000	47.94	5,082,000
Mechanical	SF	106,000	31.97	3,389,000
Electrical	SF	106,000	47.95	4,553,000
Equipment	--	--	--	729,000
Fallout Shelter (not feasible)	--	--	--	--
Total				$17,800,000

LIST OF RELATED GRAPHICS:

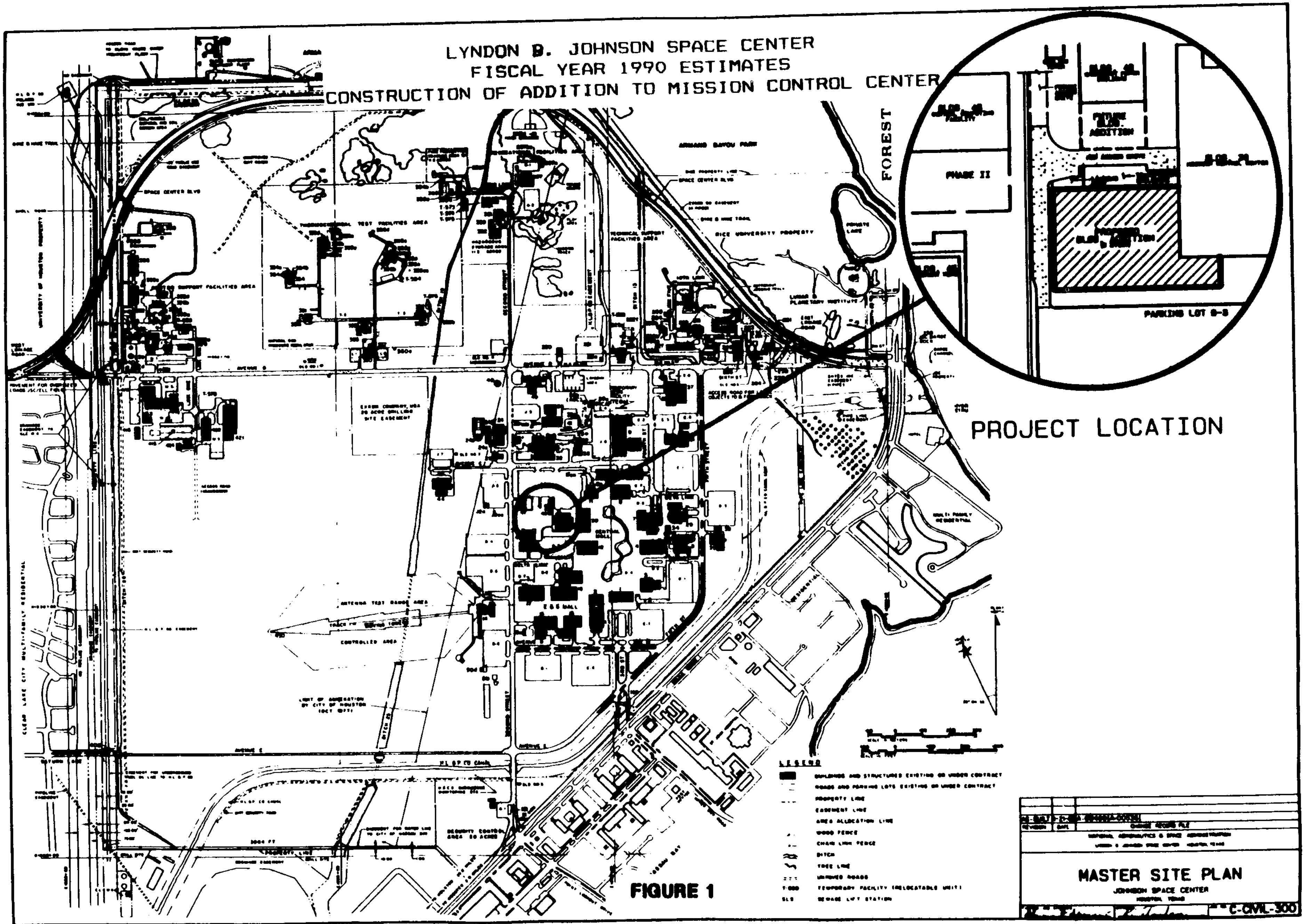
Figure 1 - Project Location
Figure 2 - Perspective

OTHER EQUIPMENT SUMMARY:

Equipment such as computer systems, computer software, workstations and personal computers and network interfaces estimated at $126,800,000 will be provided from Research and Development (R&D).

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

A Building 48 addition for backup electrical/mechanical utilities costing approximately $5 million is anticipated in FY 1992.



LYNDON B. JOHNSON SPACE CENTER
FISCAL YEAR 1990 ESTIMATES
CONSTRUCTION OF ADDITION TO MISSION CONTROL CENTER
FOREST
PROJECT LOCATION
PHASE II
PARKING LOT B-3
FIGURE 1
LEGEND
MASTER SITE PLAN
JOHNSON SPACE CENTER
C-CIVIL-300

CF 1-12

LYNDON B. JOHNSON SPACE CENTER
FISCAL YEAR 1990 ESTIMATES
CONSTRUCTION OF ADDITION TO MISSION CONTROL CENTER

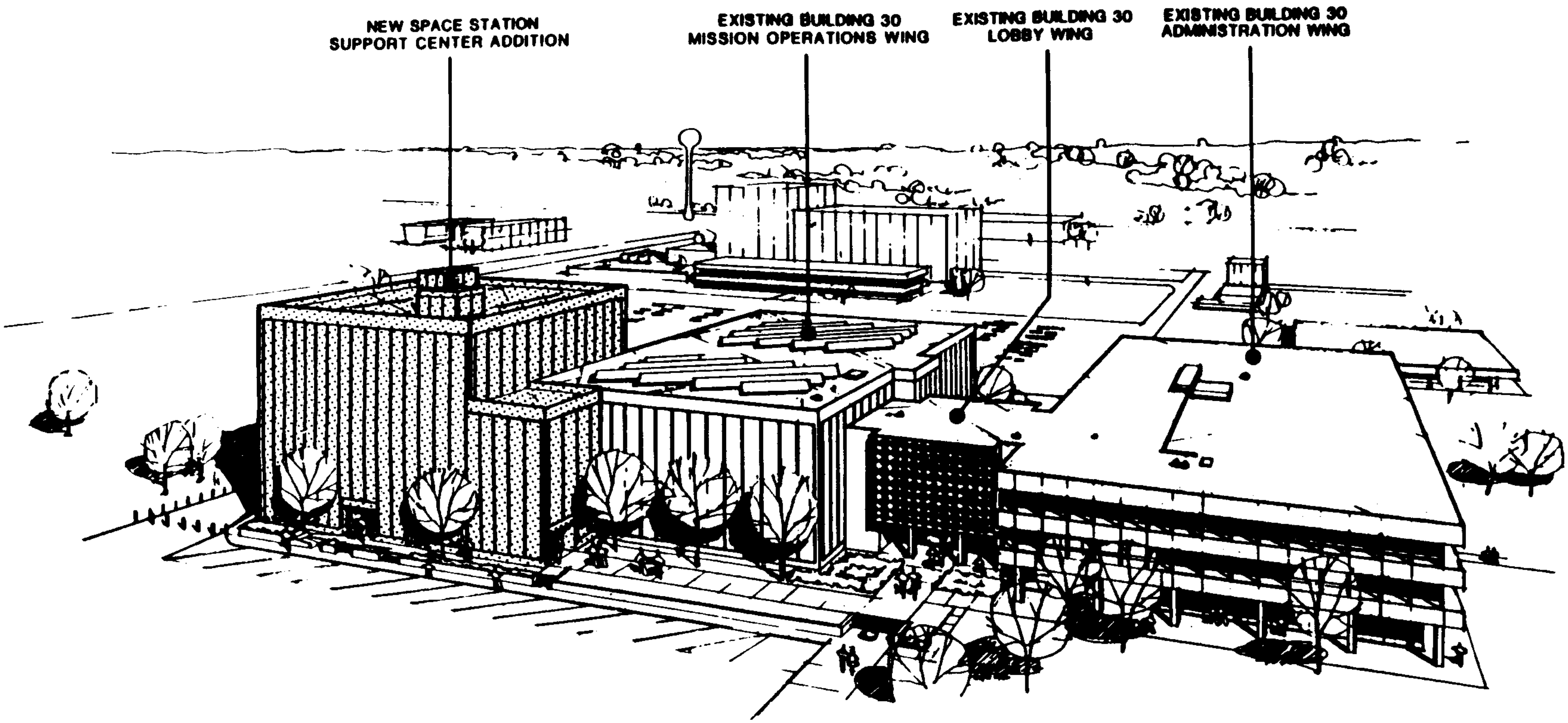


FIGURE 2

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1990 ESTIMATES

PROJECT TITLE: Construction of Addition to the Simulator/Training Facility

INSTALLATION: Lyndon B. Johnson Space Center

FY 1990 CoF Estimate: $3,800,000

LOCATION OF PROJECT: Houston, Harris County, Texas

COGNIZANT HEADQUARTERS OFFICE: Office of Space Station

FY 1989 AND PRIOR YEARS' FUNDING: The following prior years' funding is related to this project:

	Planning and Design	Construction	Total
Specific CoF Funding..........................	$319 500	---	$ 319,500
Capitalized Investment........................	---	$4,083,539	4,083,539
Total	$319,500	$4,083,539	$4,403,039

SUMMARY PURPOSE AND SCOPE:

This project provides for construction of an addition and modifications to the Mission Simulation and Training Facility, Building 5, to accommodate Space Station crew trainers, ancillary support equipment and personnel. The three-story addition contains approximately 23,200 square feet (sq. ft.) of new floor space.

PROJECT JUSTIFICATION:

This project provides necessary facility space to accommodate the trainers needed for Space Station-unique systems, operations, and crew stations. Space Station flight crews and ground-controllers require numerous trainers for multiple part-tasks and single-system tasks, and abbreviated crew-station activities. Trainers must cover a wide range of physical, mechanical and computer-aided systems of low- and high-fidelity. These systems must be fully integrated for ground/flight coordination and capable of individual or multiple-person use. These Space Station-unique trainers and ancillary support cannot be accommodated in the existing Shuttle Mission Simulators (SMS) complex.

The scope of this project makes maximum use of existing Building 5 facilities and adds only the minimum space necessary to accommodate the Space Station simulation and training. Use of 9,500 sq. ft. of existing floorspace represents a significant saving in cost. This existing space and the ground floor of the addition is required for location of the various trainers. The upper-floor of the addition is required for electronic equipment, maintenance, operations, parts storage, work areas and miscellaneous facility support space.

IMPACT OF DELAY:

If this project is not approved, there will not be adequate space at Johnson Space Center (JSC) to provide the Space Station-unique flight crew and ground-controller training required for safe and effective Space Station operations. Program operations schedules will be delayed if these facilities are not available.

)JE(DESCRIPTION:

This project provides for the construction of a three-story building addition and modifications to Building 5. The addition to the south side of the existing south-wing high bay includes 23,200 sq. ft. of floor space. The first floor of the addition will comprise approximately 7.400 sq. ft. with 4,300 sq. ft. of computer flooring. The second floor of the addition will contain approximately 7,400 sq. ft. with 6,900 sq. ft. of computer flooring. The third floor will be a future computer room of approximately 7,400 sq. ft. The existing high bay will be modified by the removal of existing walls, the addition of approximately 3,000 sq. ft. of computer flooring, and approximately 1,000 sq. ft. of rest room space. The project work also includes heating, ventilation and air-conditioning: an elevator, stairs and mechanical room. Site work includes utilities to the addition, modification of storm drainage, landscaping and the construction of a paved parking area for approximately 170 vehicles. A secure wall with a security entrance will be provided between the existing high bay and the existing secure area of Building 5.

PROJECT COST ESTIMATE:

The basis of this cost estimate is a preliminary engineering report (PER).

	Unit of Measure	Quantity	Unit cost	cost
Land Acquisition	---	---	---	---
Construction	---	---	---	$3,800,000
Site Preparation:				
Utilities Modifications and Relocations	LS	---	---	127,000
Paved Parking Lot	LS	---	---	200,000
Electrical Switches and Unit Substation	LS	---	---	102,000
Modifications to Existing Building 5:				
Architectural and Structural	LS	---	---	210,000
Mechanical	LS	---	---	10,000
Electrical	LS	---	---	32,000
New Building Addition:				
Foundation	SF	23,200	$ 6.63	154,000
Structural	SF	23,200	11.81	274,000
Architectural	SF	23,200	40.00	928,000
Heating, Ventilating, and Air-conditioning	SF	23,200	36.50	847,000
Plumbing	SF	23,000	4.04	93,000
Sprinkler and Standpipe System	SF	23,200	3.75	87,000
Electrical, Security, and Fire Alarm	SF	23,200	31.72	736,000
Equipment	---	---	---	---
Fallout Shelter (not feasible)	---	---	---	---
Total				$3,800,000

LIST OF RELATED GRAPHICS:

OTHER EQUIPMENT SUMMARY:

Equipment such as ground systems trainers, module systems trainers, station proximity operations trainers, and computers estimated to cost $68,200,000 will be funded from Research and Development.

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

No future CoF funding will be required to complete this project.

LYNDON B. JOHNSON SPACE CENTER
FISCAL YEAR 1990 ESTIMATES
CONSTRUCTION OF ADDITION TO THE SIMULATOR/TRAINING FACILITY

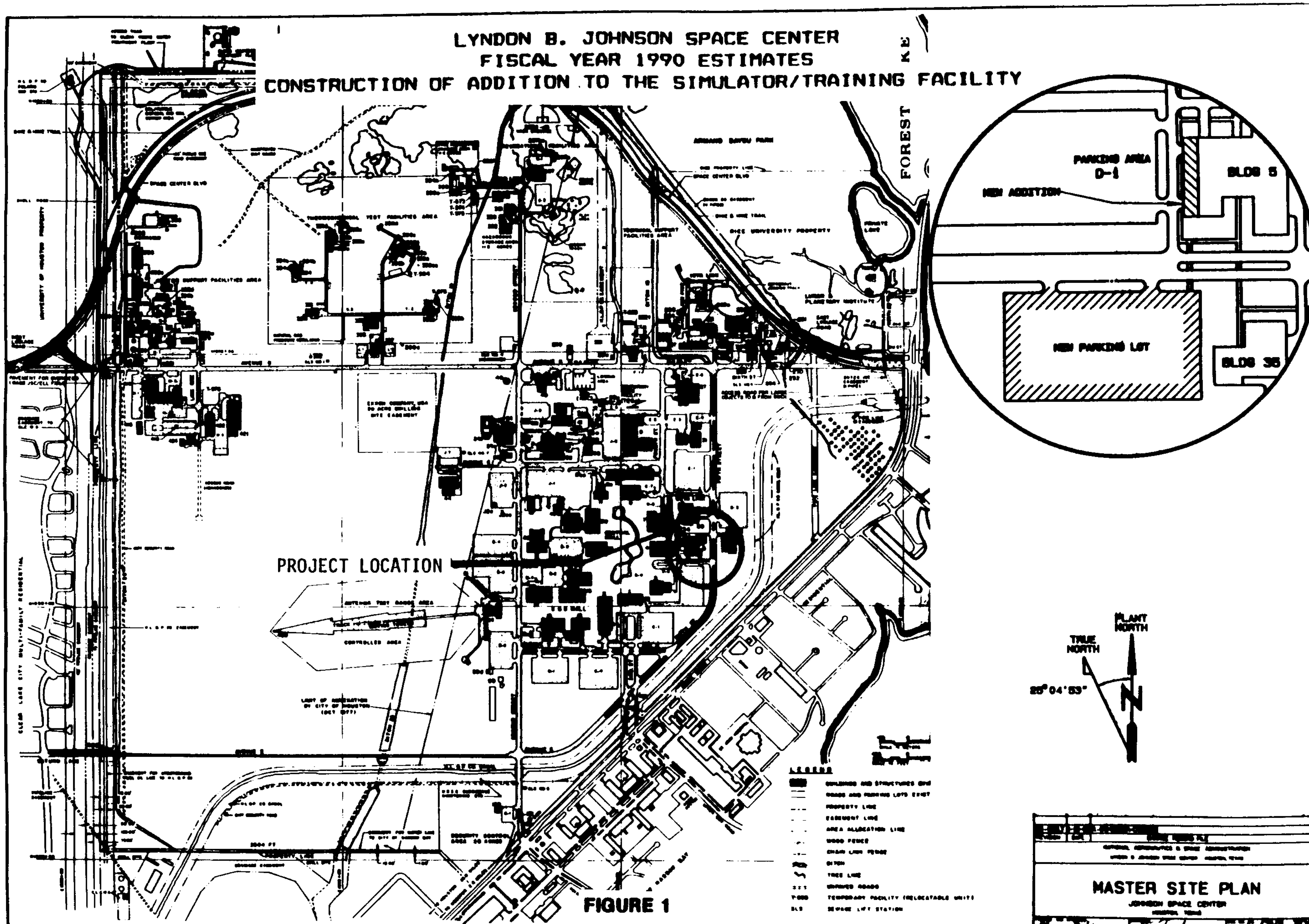
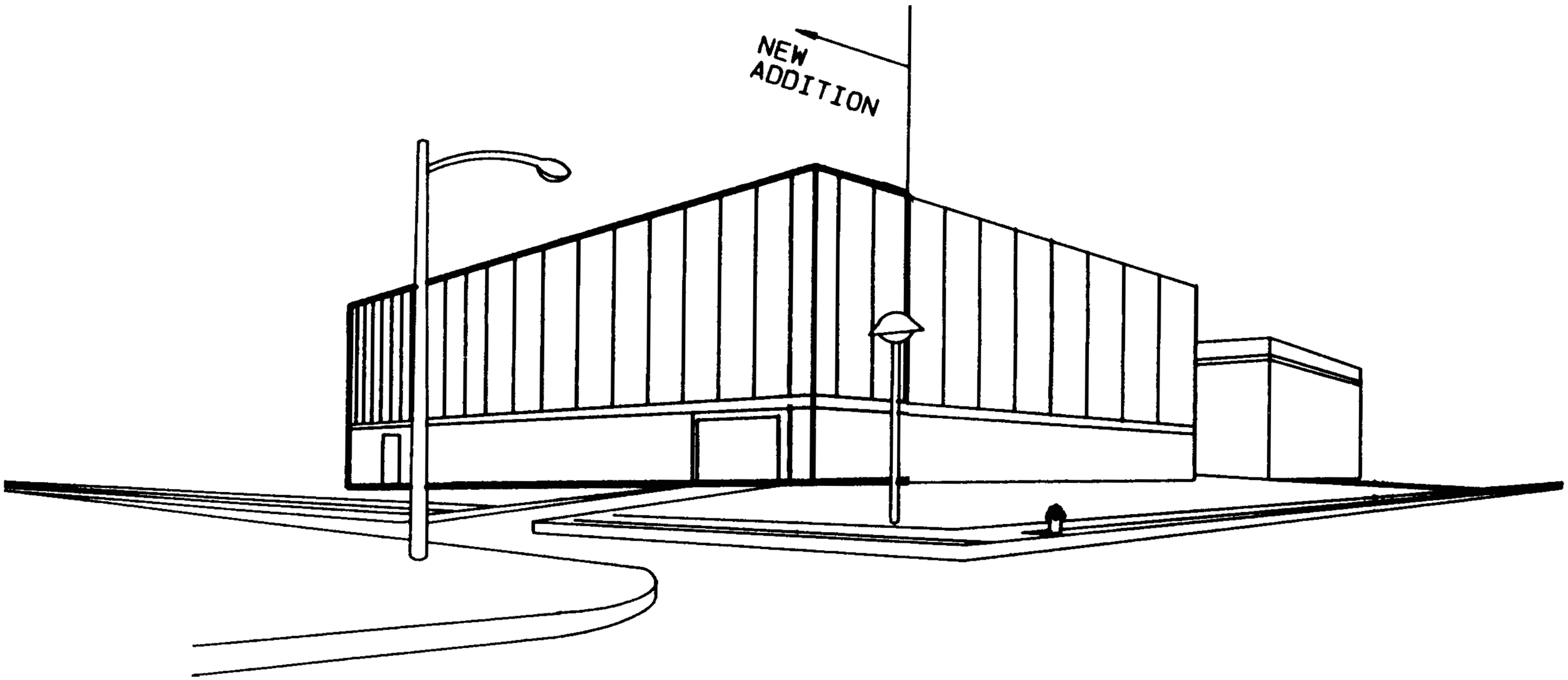


FIGURE 1

LYNDON B. JOHNSON SPACE CENTER
FISCAL YEAR 1990 ESTIMATES
CONSTRUCTION OF ADDITION TO THE SIMULATOR/TRAINING FACI ITO



P≤ SPECTIV≤

FIGURE 2

LYNDON B. JOHNSON SPACE CENTER
FISCAL YEAR 1990 ESTIMATES
CONSTRUCTION OF ADDITION TO THE SIMULATOR/TRAINING FACILITY

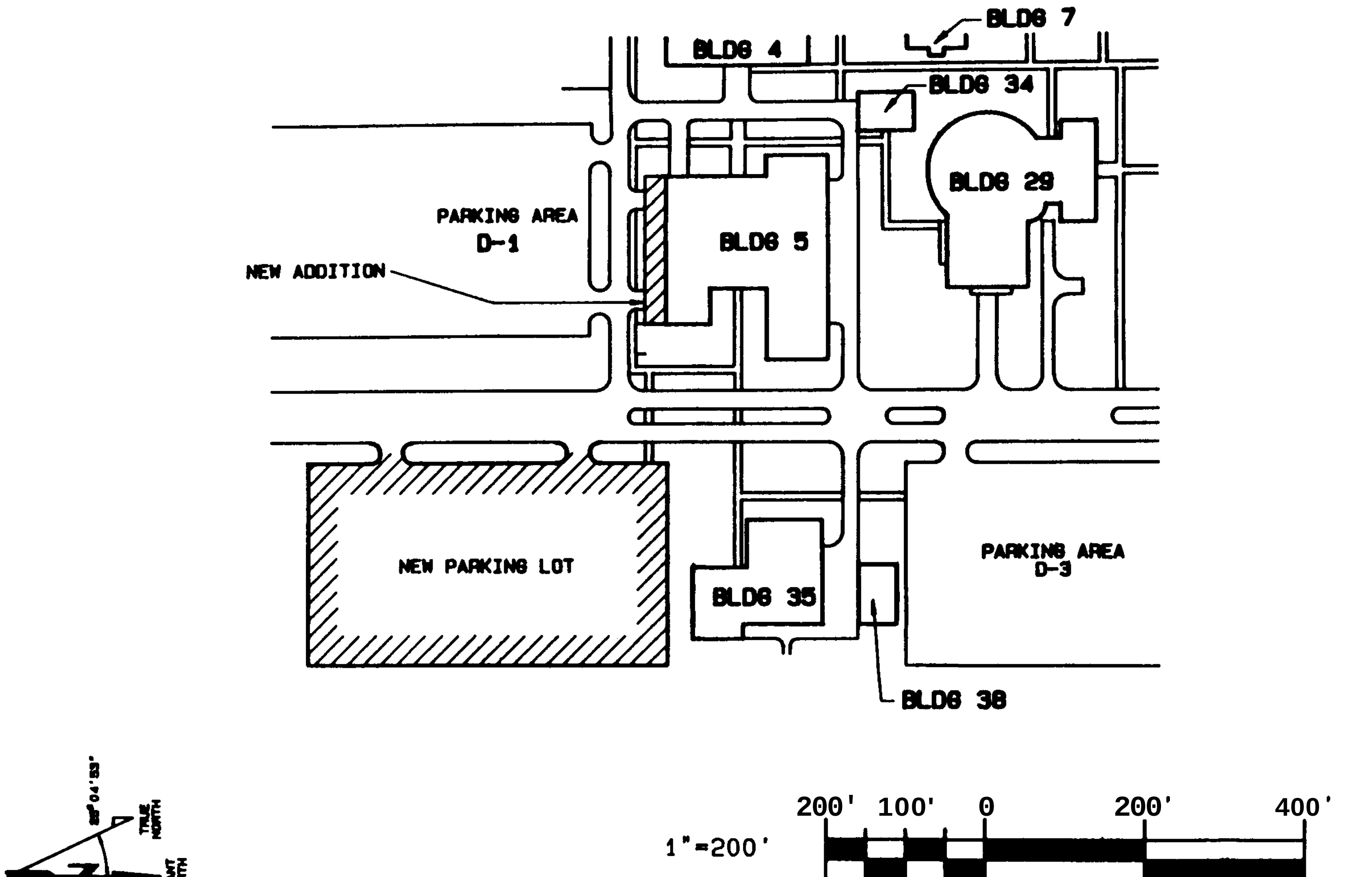


FIGURE 3

LYNDON B. JOHNSON SPACE CENTER
FISC# YEAR 1990 ESTIMATES
CONSTRUCTION OF ADDITION TO THE SIMULATOR/TRAINING FACILITY

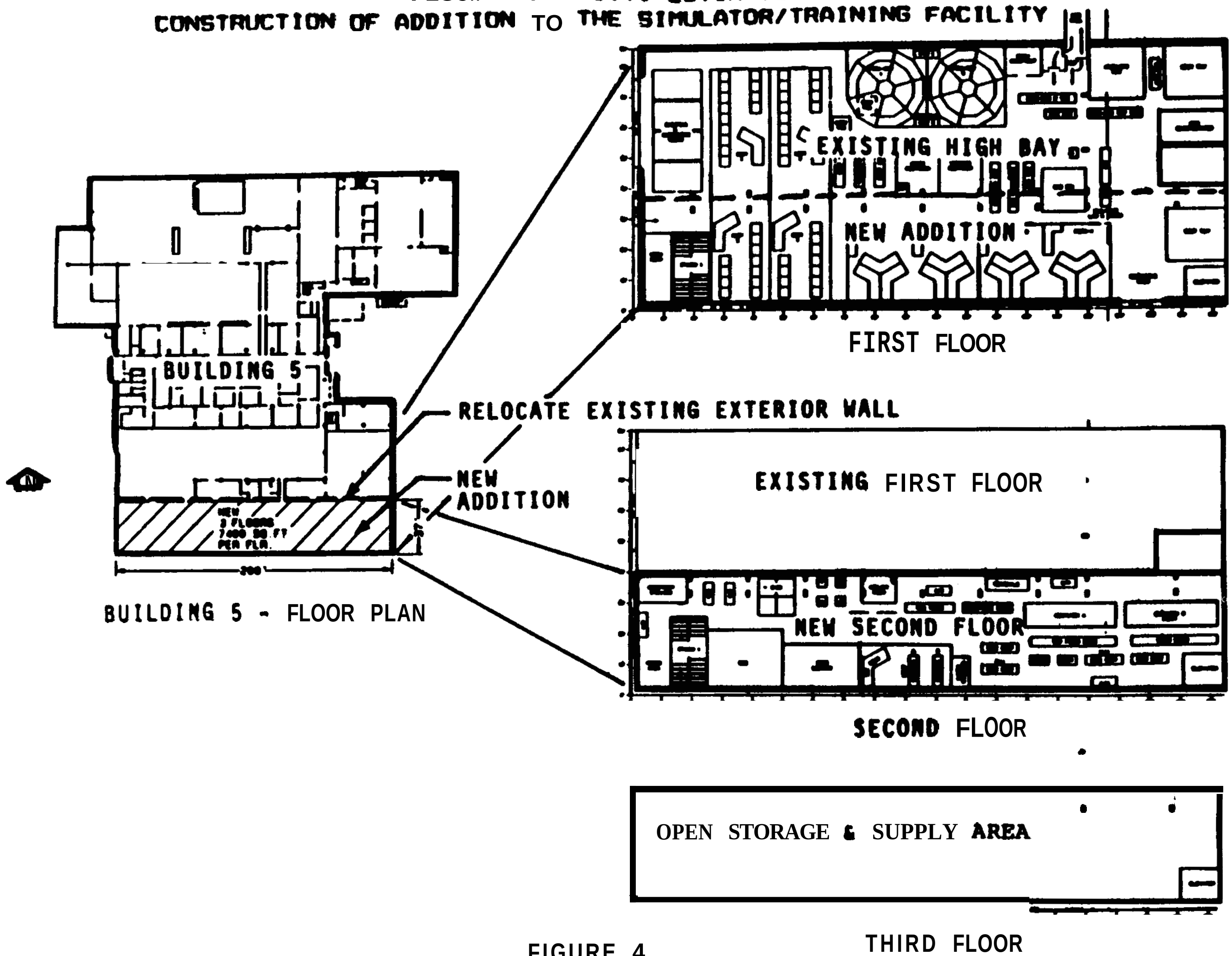


FIGURE 4

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1990 ESTIMATES

PROJECT TITLE: Modification for Expanded Solar Simulation

INSTALLATION: Lyndon B. Johnson Space Center

FY 1990 CoF Estimate: $2,000,000

LOCATION OF PROJECT: Houston, Harris County, Texas

COGNIZANT HEADQUARTERS OFFICE: Office of Space Station

FY 1989 AND PRIOR YEARS' FUNDING: The following prior years' funding is related to this project:

	Planning and Design	Construction	Total
Specific CoF Funding......................	~190,000	---	$ 190,000
Capitalized Investment....................	-0-	$39,920,000	39,920, 000
Total..................................	~190,000	$39,920,000	$40,110,000

SUMMARY PURPOSE AND SCOPE:

This project provides for enlarging the support facilities for the xenon lighting system and modifications to Chambers A and B in the Space Environment Simulation Laboratory (SESL), Building 32. High-fidelity solar test environments for the large, complex, and thermally sensitive space structures of the Space Station program must be simulated for validation and verification testing of hardware.

PROJECT JUSTIFICATION:

This project is required to provide high-fidelity solar simulation test environments for the large, complex, and thermally sensitive space structures of the Space Station program. Testing requirements for both Chambers A and B are increasing in quantity and simulation capability for critical Space Station and STS hardware systems. In-house and contractor technology development testing needs for Space Station thermal test beds are immediate. However, partial and integrated structures testing will be required in these chambers. The expansion of the solar simulation capability provided by this project will assure the availability and quality of space environment testing for a variety of technology demonstrations and/or assessments and for actual flight hardware testing and verification. A high-quality solar simulation component of space-environment testing is required to assure the adequacy of structural and system designs while minimizing the hardware and mission performance costs of artificially "safe" overdesigns. The solar simulation capability provided by this project re-establishes that capability. This capability was vital to the successes of earlier program space systems tested in these unique man-rated chambers. Space Station operations and success requirements mirror those of the Apollo program where vehicles and systems had to perform properly.

IMPACT OF DELAY:

If this project is not approved, the effects of solar radiation on large complex structures in the space environment cannot be adequately assessed and accommodated in hardware designs. The larger structures and systems of the Space Station program will be forced to more conservative, nonvalidated, design solutions. Thermally-induced problems, not anticipated because of lack of adequate test facilities, could result in significant safety risks.

PROJECT DESCRIPTION:

This modification of the Space Environment Simulation Laboratory (SESL), Building 32, provides for the upgrading and expansion of facilities for solar simulation systems. The modification of the facilities for Chamber B will enable the number of solar xenon lamps to be increased from 19 to 37, thereby enlarging the diameter capable of being irradiated in the chamber from 13 to 20 feet. In addition, Chamber A will be retrofitted and reconfigured to accept up to 37 xenon light modules in 63 positions. The project includes replacing the existing heat exchanger in Chamber B with a unit of sufficient capacity to handle the additional heat produced by the new light modules. The existing Chamber B cooling system will be extended to Chamber A by interconnecting piping. A new de-ionized water pump, valves and flow controls will be installed to support full xenon light module operation. Stainless steel water piping assemblies will be installed beneath new, raised computer flooring in Chambers A and B for the light power supply units. As part of the Chamber A reconfiguration, the obsolete carbon arc power, control and gas and water piping assemblies will be replaced with cabling and gaseous nitrogen piping. These upgrades are required to support the xenon light modules. The guide rail extensions on Chamber A will be removed and the elevator platform will be extended. Eleven Chamber A wall nozzle penetration assemblies will be modified to correct anomalies in alignment to accommodate module installation.

PROJECT COST ESTIMATE:

This cost estimate is based on Preliminary Engineering Report.

	Unit of Measure	Quantity	Unit cost	cost
Land Acquisition	--	--	--	--
Construction	--	--	--	$2,000,000
Raised Computer Floor, Steps Handrails, and Ramps	SF	625	$ 24	15,000
Modify Elevator, Platform, and Bridge	LS	--	--	24,000
Chamber A Wall/Nozzle Modification	EA	11	85,273	938,000
New Heat Exchanger	EA	1	85,000	85,000
8-Inch De-ionized Water Piping	LF	400	200	80,000
Pump, Valves, Flow Control, and GN2 Piping	LS	--	--	122,000
Underfloor Water Piping Assemblies..	EA	3	85,300	256,000
GN2 Distribution System	LS	--	--	135,000
Cable and Tray-Power Controls, Water Cooled	LS	--	--	210,000
Starter, Control Rack Heater Units	LS	--	--	15,000
Demolition	LS	--	--	120,000
Equipment	--	--	--	--
Fallout Shelter (not feasible)	--	--	--	--
Total				$2,000,000

LIST OF RELATED GRAPHICS:

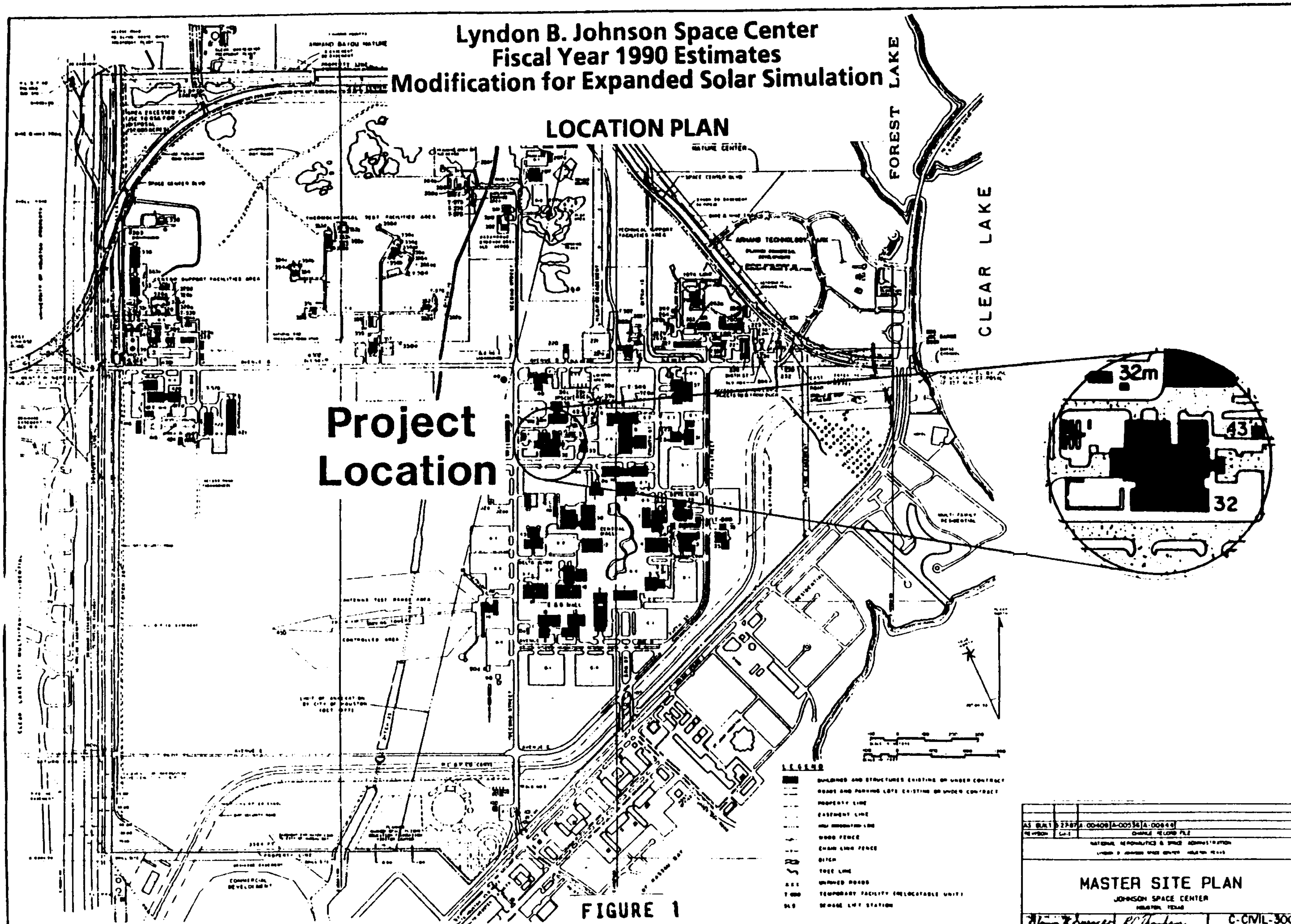
Figure 1 - Project Location
Figure 2 - Building Floor Plan
Figure 3 - Detail of Top of Chamber B

OTHER EQUIPMENT SUMMARY:

Equipment to be funded with Research and Development resources will consist of solar modules, power transformer and cabling at an estimated cost of $5,900,000.

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

There is no future funding required to complete this project.


Lyndon B. Johnson Space Center
Fiscal Year 1990 Estimates
Modification for Expanded Solar Simulation
LOCATION PLAN
FOREST LAKE
CLEAR LAKE
Project Location
32m
43
32
MASTER SITE PLAN
JOHNSON SPACE CENTER
C-CIVIL-300
FIGURE 1

Lyndon B. Johnson Space Center
Fiscal Year 1990 Estimates
Modification for Expanded Solar Simulation

BUILDING 32, PARTIAL HIGH BAY FLOOR PLAN

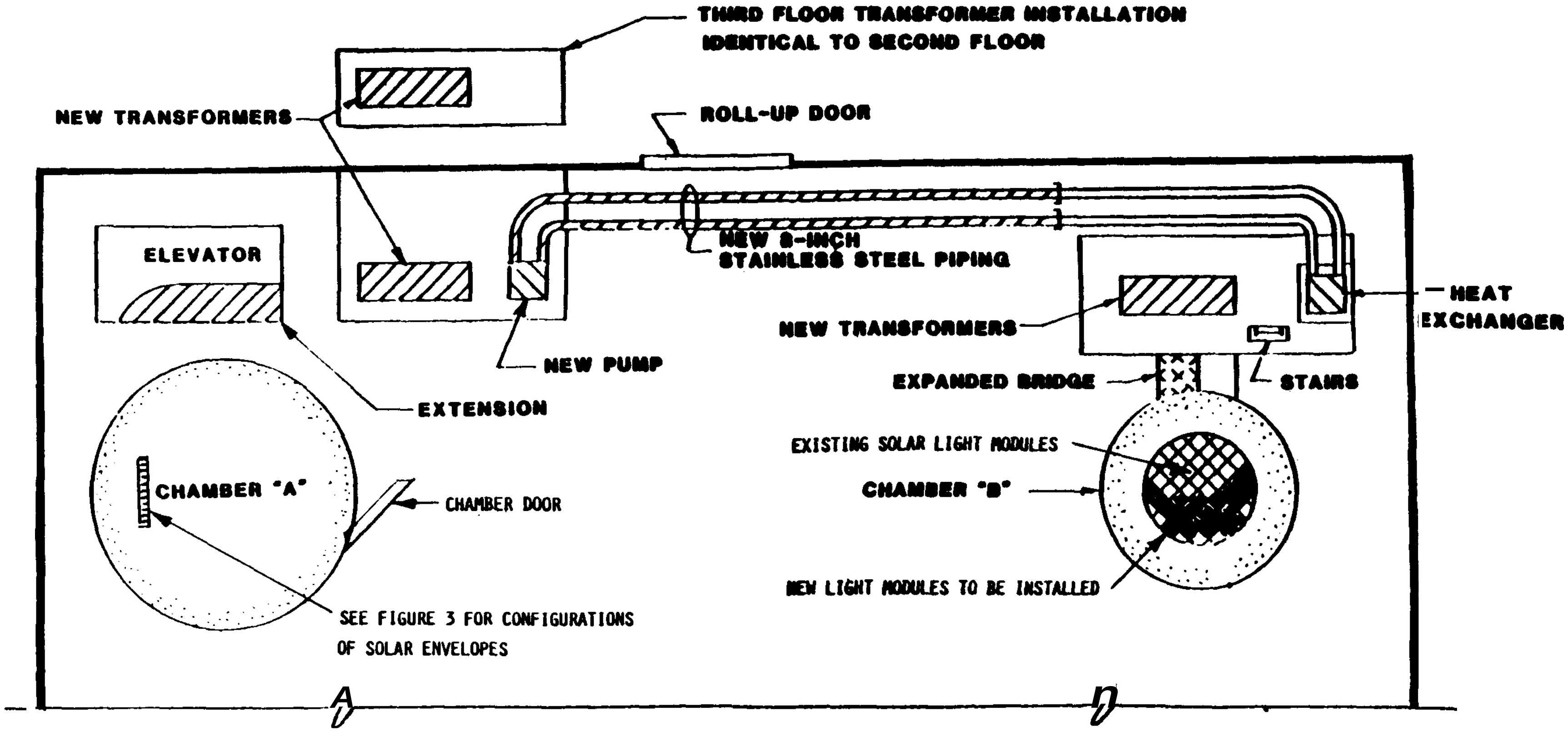
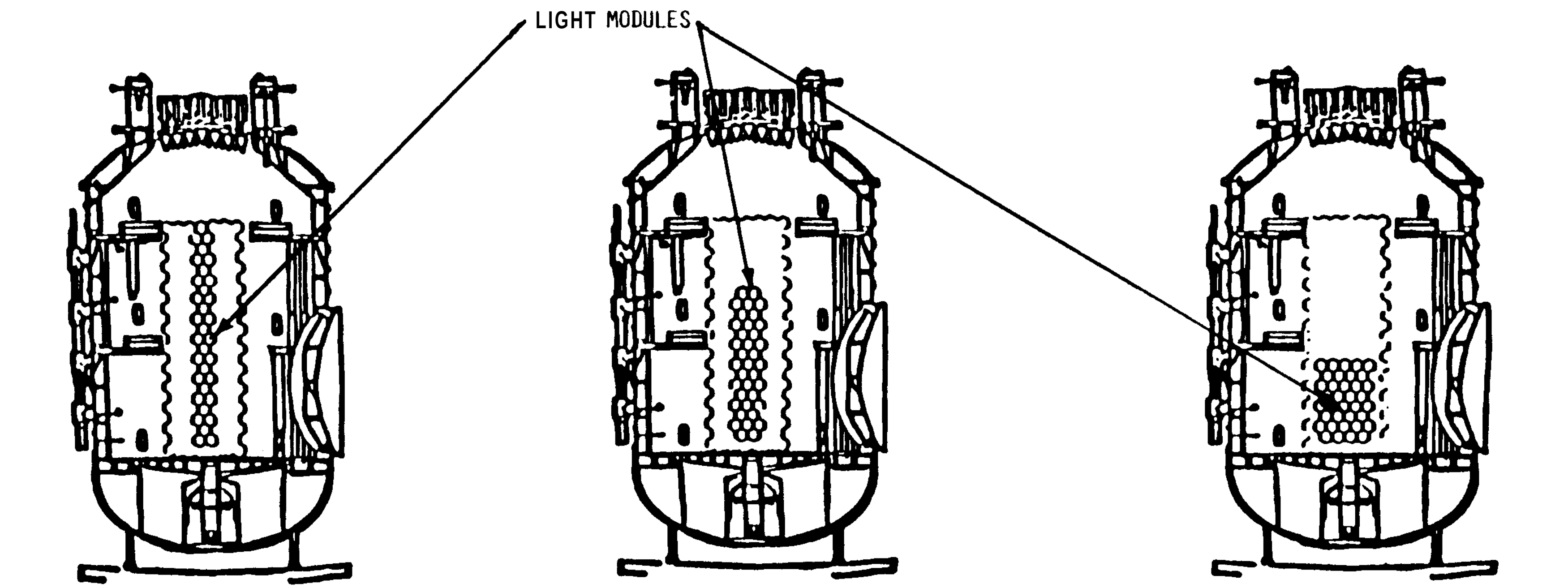


FIGURE 2

Lyndon B. Johnson Space Center
Fiscal Year 1990 Estimates
Modification for Expanded Solar Simulation

VARIOUS SOLAR ENVELOPE CONFIGURATIONS



CHAMBER A SOLAR SIMULATOR

SOLAR ENVELOPE 40' X 66'

CHAMBER A SOLAR SIMULATOR

OOLAR ENVELOPE 7' X 42'

CHAMBER A SOLAR SIMULATOR

OOLAR ENVELOPE 16' X 21'

FIGURE 3

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1990 ESTIMATES

PROJECT TITLE: Modifications of Process Technology Facility for Space Station

INSTALLATION: George C. Marshall Space Flight Center

FY 1990 CoF Estimate: $4,000,000

LOCATION OF PROJECT: Marshall Space Flight Center, Madison County, Alabama

COGNIZANT HEADQUARTERS OFFICE: Office of Space Station

FY 1989 AND PRIOR YEARS' FUNDING: The following prior years' funding is related to this project:

	Planning and Design	Construction	Total
Specific CoF Funding	$350,000	---	8 350,000
Capitalized Investment	---	$5,143,587	5,143,587
Total	$350,000	$5,143,587	$5,493,587

SUMMARY PURPOSE AND SCOPE:

This project provides for modification of the Process Technology Facility, Building 4707, for the development of new productivity techniques for Space Station common module fabrication and on-orbit repair techniques. The manned Space Station will remain in orbit for many years and improved module seals to reduce leakage and on-orbit repair to damaged hardware will be mandatory for safe habitation. A 10-foot by 15-foot working diameter walk-in vacuum chamber, robotic water jet and composite test component areas will be provided for development and testing of potential space assembly processing and repair activities.

PROJECT JUSTIFICATION:

The manned space station is being developed to remain in orbit for approximately 20 years. In order to provide longevity and successful operation, structural repair and refurbishment of sealants and surface coatings must be accomplished in orbit. Development of the required special repair equipment must include testing in a simulated vacuum environment. Robotized electron beam welding, cutting, soldering and metal spray coating will be developed and demonstrated. Means of managing the debris generated by this process will be studied. Repair equipment must be optimized for efficiency, reliability and compactness. The Space Station has twice the volume of Skylab and more than 1,000 linear feet of seals. Accordingly, initial priority will be placed on verification of seal concepts and leak rate. Outgassing characteristics will be determined.

Also needed is the development of an on-orbit bonding and sealing technique, and adhesives and coatings for Space Station module repair and refurbishment work. Candidate materials must be tested for outgassing. flammability, toxicity, bonding strength and sealing efficiency. A laser will be used for the development of ground operations and on-orbit applications including welding and cutting. Work will also include precision alignment of large structures, non-destructive testing and leak detection. The water knife laboratory will provide the capability for development of ground manufacturing processes with computerized robotic high-pressure water jet cutting of high strength metals and advanced composites to reduce the weight of space structures and launch vehicles.

IMPACT OF DELAY:

Delay of the project will mean that new productivity techniques will not be accomplished in time to support the development of required special equipment needed for the fabrication of the Space Station and could affect the longevity and safety of Space Station operations.

PROJECT DESCRIPTION:

Work includes the modification of approximately 4,000 square feet (sq. ft.) of space with the installation of a 10-foot by 15-foot-working diameter Space Environment Vacuum Chamber (Figure 2), a clean room area of 1,500 sq. ft., control room. and instrumentation. This includes the modification of 2,150 sq. ft. of space for cryo pumps and related mechanical equipment. The thermal shrouds in the vacuum chamber and cryo pumps will be cooled with liquid nitrogen (LN_2) supplied from a 13,500 gallon Government Furnished Equipment (GFE) LN_2 dewar. Work also includes an addition to the building of 1,460 sq. ft. of steel frame and roof construction for a robotic water jet laboratory and modification of 1,330 sq. ft. for a composite test component preparation cell.

PROJECT COST ESTIMATE:

This cost estimate is based on a 90 percent design submission.

	Unit of Measure	Quantity	Unit cost	cost
Land Acquisition	---	---	---	---
Construction	---	---	---	$4,000,000
Space environment vacuum chamber (10-foot by 15-foot working diameter)	LS	---	---	$2,950,000
Clean room	SF	1,500	$153.33	230,000
Mechanical equipment room	SF	2,150	97.67	210.000
Robotic water jet laboratory	SF	1.460	178.08	260,000
Composite test component preparation laboratory	SF	1,330	263.16	350,000
Equipment	---	---	---	---
Fallout shelter (not feasible)	---	---	---	---
Total				$4,000,000

LIST OF RELATED GRAPHICS:

Figure 1 - Location Plan
Figure 2 - Building 4707 Plan View

OTHER EQUIPMENT SUMMARY:

Equipment to be funded with Research and Development (R&D) resources will consist of a 10-foot by 8-foot diameter autoclave, artificial intelligence system and microvax computer at an estimated cost of $2,700,000.

FUTURE CoF FUNDING REQUIRED TO COMPLETE THIS PROJECT:

No future CoF resources are required to complete the present scope of this project. However, additional modifications to the Process Technology Facility may be required to support additional Space Station requirements.

MARSHALL SPACE FLIGHT CENTER
FISCAL YEAR 1990 ESTIMATES
MODIFICATIONS OF PROCESS TECHNOLOGY FACILITY FOR SPACE STATION

LOCATION PIAN

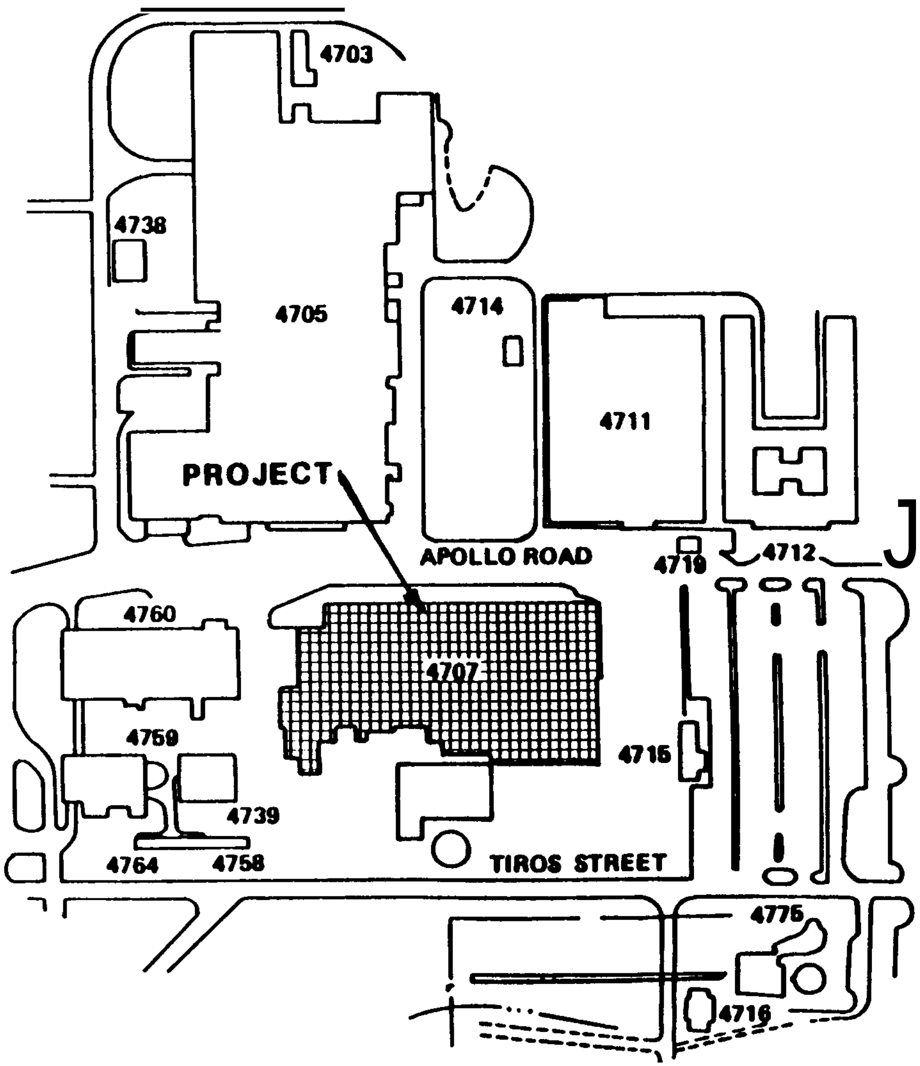


FIGURE 1

MARSHALL SPACE FLIGHT CENTER
FISCAL YEAR 1990 ESTIMATES
MODIFICATIONS OF PROCESS TECHNOLOGY FACILITY FOR SPACE STATION

BUILDING 4707 PIAN VIEW

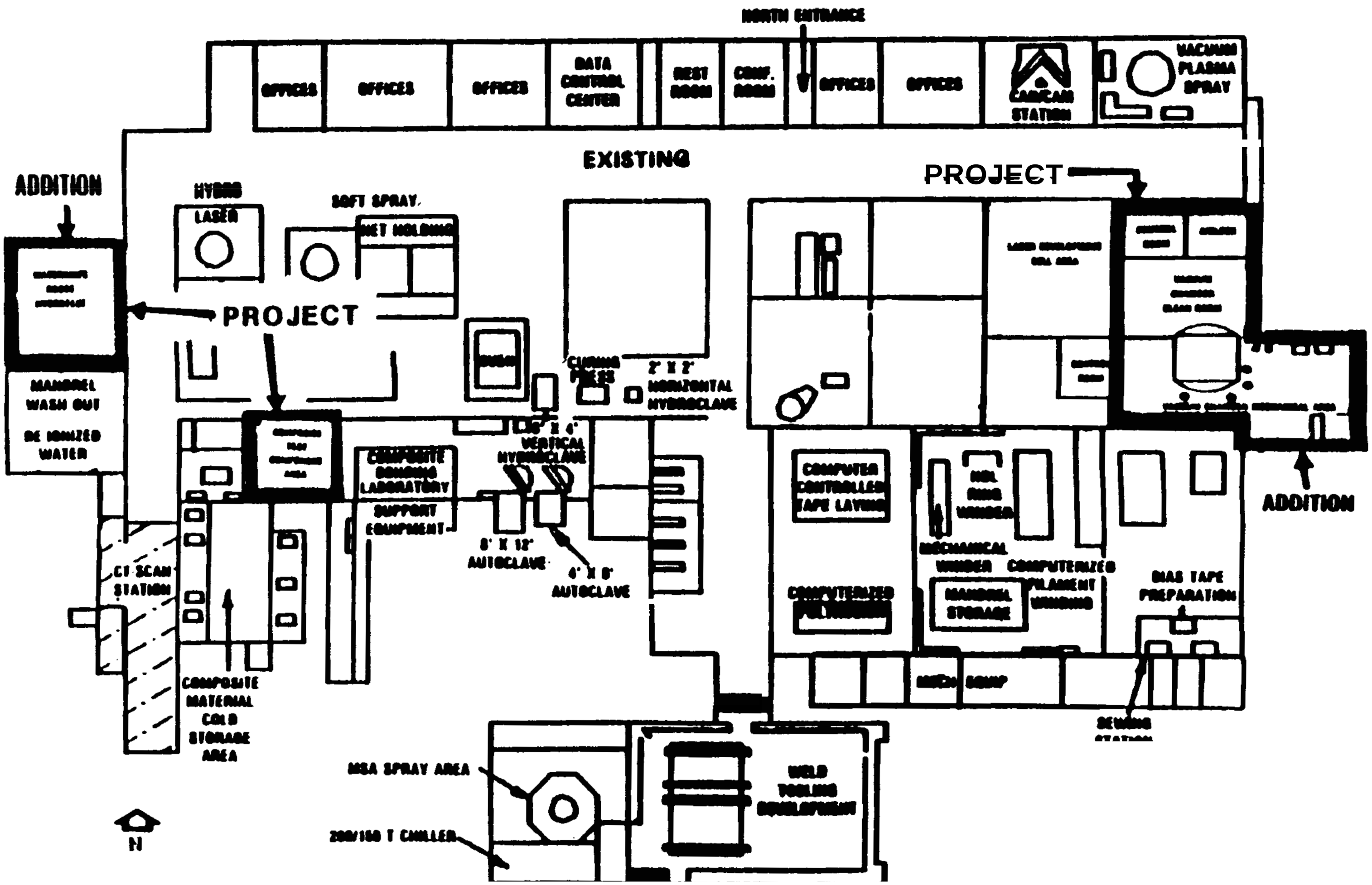


FIGURE 2

SPACE FLIGHT FACILITIES

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1990 ESTIMATES

SUMMARY

SPACE FLIGHT FACILITIES

	Amount	Page No.
Office of Space Flight:		
Replace Cooling Towers, Launch Complex 39 Utility Annex, Kennedy Space Center	4,600,000	CF 2-1
Replace Launch Complex 39, Pad A Chillers and Controls, Kennedy Space Center	1,200,000	CF 2-7
Replace Roofs, Launch Complex 39, Kennedy Space Center	11,000,000	CF 2-13
Replace Vehicle Assembly Building Air Handling Units, Kennedy Space Center	1,800,000	CF 2-20
Upgrade Orbiter Modification and Refurbishment Facility to Orbiter Processing Facility #3, Kennedy Space Center	26,000,000	CF 2-26
Modification of High Pressure Industrial Water System, Stennis Space Center	2,000,000	CF 2-34
Replacement of High Pressure Gas Storage Vessels, Stennis Space Center	3,000,000	CF 2-39
Construction of National Resource Protection, Various Locations	3,800,000	CF 2-44
Total	53,400,000	

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1990 ESTIMATES

PROJECT TITLE: Replace Cooling Towers, Launch Complex 39 Utility Annex

INSTALLATION: John F. Kennedy Space Center

FY 1990 CoF Estimate: $4,600,000

LOCATION OF PROJECT: John F. Kennedy Space Center, Brevard County, Florida

COGNIZANT HEADQUARTERS OFFICE: Office of Space Flight

FY 1989 AND PRIOR YEARS' FUNDING: The following prior years' funding is related to this project:

	Planning and Design	Construction	Total
Specific CoF Funding......................	$330,000	--	$ 330,000
Capitalized Investment...................	--	$2,133,000	2,133,000
Total.................................	$330,000	$2,133,000	$2,463,000

SUMMARY PURPOSE AND SCOPE:

This project provides for the replacement of the existing wooden cooling towers at the Launch Complex 39 Utility Annex with a new four-cell masonry/ceramic cooling tower. The existing towers are over 20 years old and have deteriorated to a point where reliability is a problem and excessive maintenance is necessary. This project restores reliability of air-conditioning in direct support of Space Transportation System (STS) operations.

PROJECT JUSTIFICATION:

This project is required to provide the necessary cooling for Shuttle processing activities at Launch Complex 39 (Figure 2). The facilities supported include the Vehicle Assembly Building, Launch Control Center, Orbiter Processing Facility, Orbiter Modification and Refurbishment Facility and Thermal Protection System Facility.

The two existing 5,000-ton wooden towers are in a severely deteriorated condition, and recent temporary repairs and continued maintenance cannot keep the towers operational much longer. The growth in cooling requirements now exceeds the capacity of one 5,000-ton tower, and both towers cannot be maintained in continuous operation. A new cooling system with additional capacity is needed to restore reliability of air-conditioning support to STS operations. The proposed four-cell cooling tower (Figure 3) will accomplish this requirement by providing the capability to have two cells on-line, one held in backup to satisfy STS launch requirements, and one cell taken off-line for maintenance or repair.

IMPACT OF DELAY:

If this project is not approved, the essential air-conditioning support to the STS facilities will become a high risk operation that could delay Shuttle launches.

PROJECT DESCRIPTION:

This project provides for the removal of the existing wooden cooling towers and associated equipment and replacement with a masonry/ceramic four-cell tower. Condenser water pumps and associated piping will be replaced. A new motor control center and power distribution system will be installed. New condenser water supply and return mains will be provided between the new tower and the Launch Complex 39 Utility Annex.

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Cost
Land Acquisition	---	---	---	---
Construction				
Demolition	LS	---	---	165,000
Asbestos Removal	LS	---	---	100,000
Structural	CY	5042	19[illegible]	995,000
Cooling Tower Cell, 3,000-tons	EA	4	[illegible]1 50[illegible]	2,646,000
Electrical	LS	---	--	694,000
Total				$4,[illegible]00 000

LIST OF RELATED GRAPHICS:

Figure 1 - Location Plan
Figure 2 - Site Plan
Figure 3 - Plan View

OTHER EQUIPMENT SUMMARY:

None.

FUTURE CoF ESTIMATED FUNDING REQUESTED TO COMPLETE THIS PROJECT:

No future CoF funding is anticipated for this project at this time.

JOHN F. KENNEDY SPACE CENTER
FISCAL YEAR 1990 ESTIMATES
REPLACE COOLING TOWERS, LAUNCH COMPLEX 39 UTILITY ANNEX

LOCATION PLAN

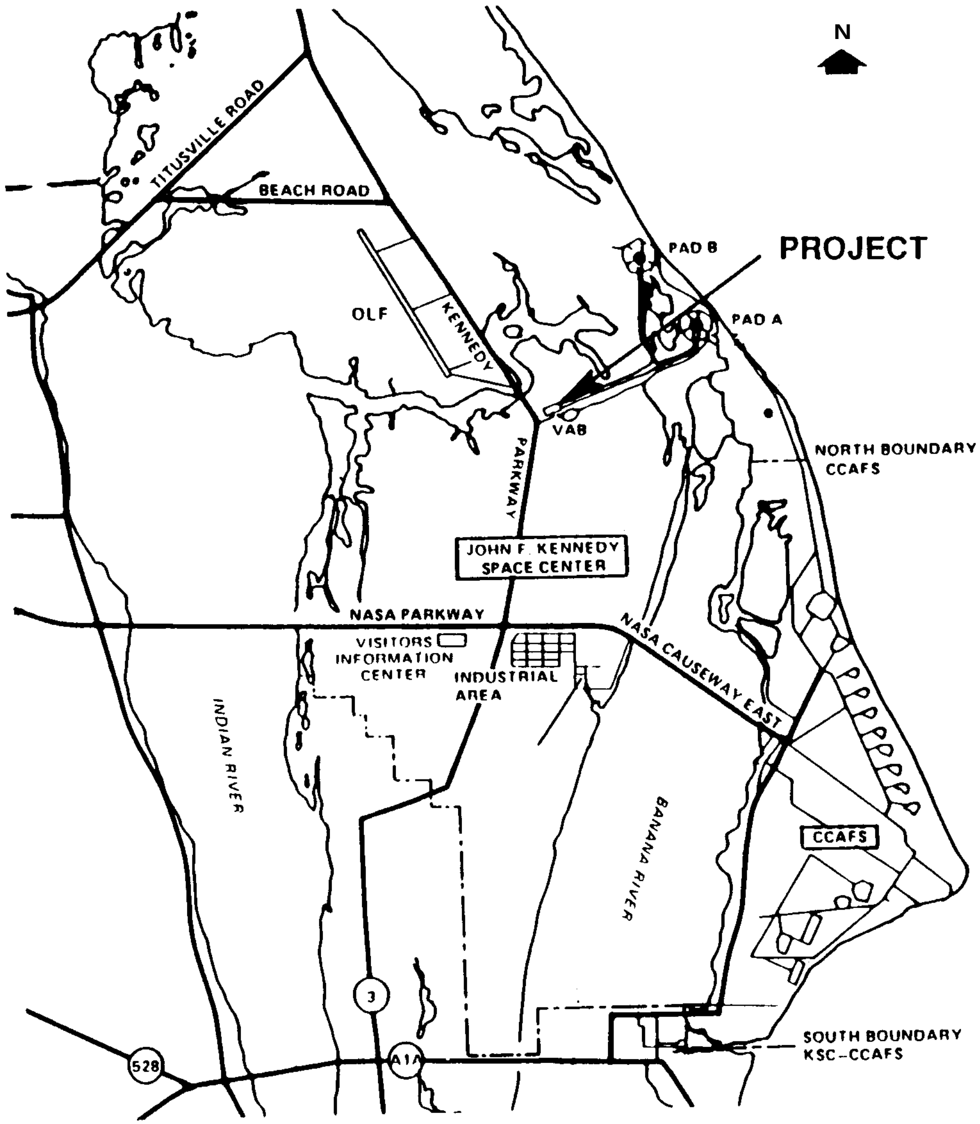


FIGURE 1

JOHN F. KENNEDY SPACE CENTER
FISCAL YEAR 1990 ESTIMATES
REPLACE COOLING TOWERS, LAUNCH COMPLEX 39 UTILITY ANNEX
SITE PLAN

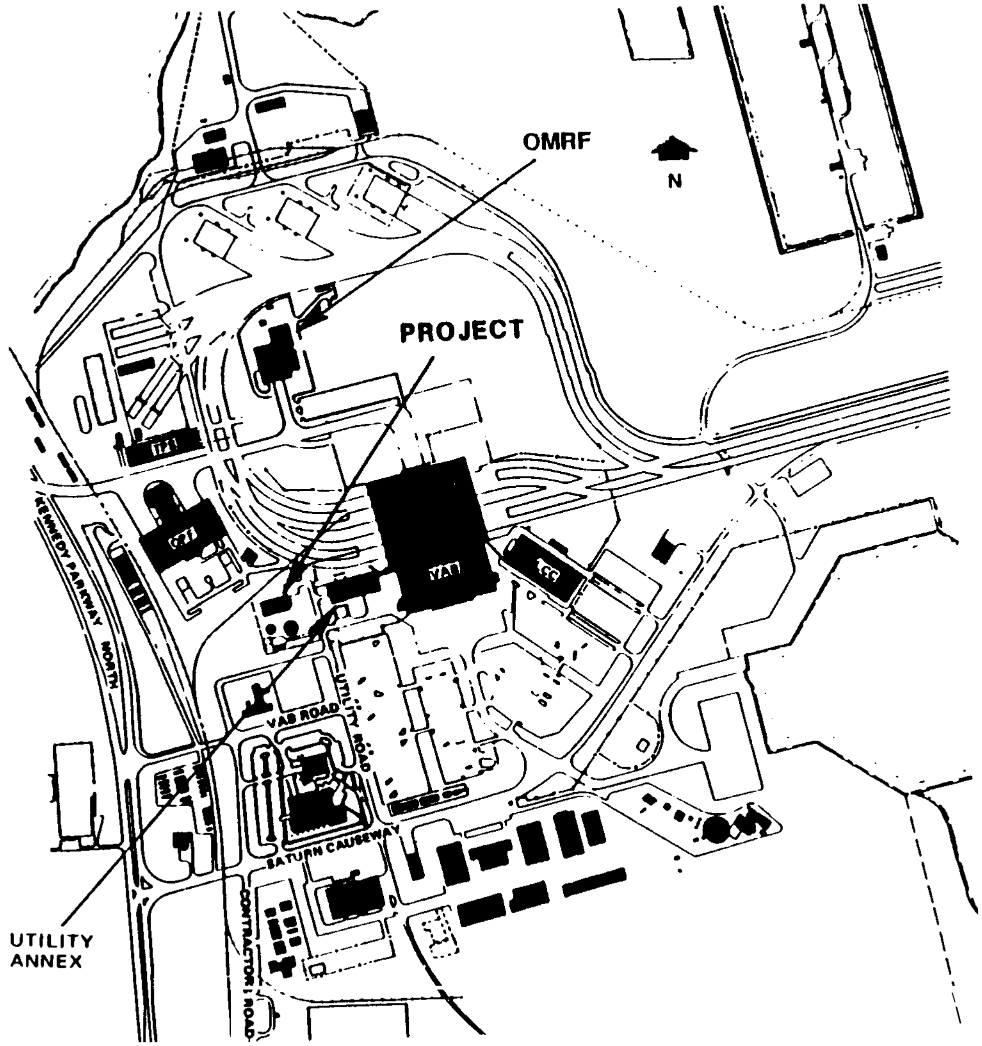


FIGURE 2

JOHN F. KENNEDY SPACE CENTER
FISCAL YEAR 1990 ESTIMATES
REPLACE COOLING TOWERS, LAUNCH COMPLEX 39 UTILITY ANNEX
PLAN VIEW

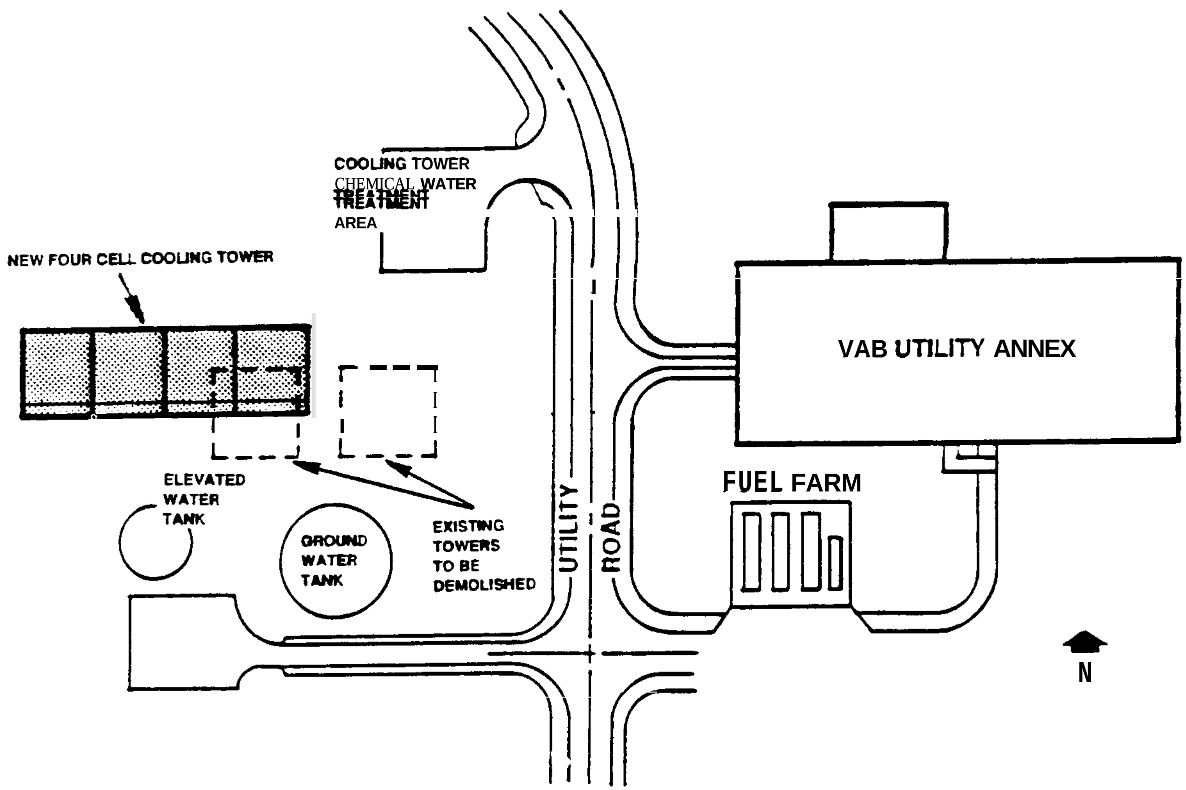


FIGURE 3

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1990 ESTIMATES

PROJECT TITLE: Replace Launch Complex 39, Pad A Chillers and Controls

INSTALLATION: John F. Kennedy Space Center

FY 1990 CoF Estimate: $1,200,000

LOCATION OF PROJECT: John F. Kennedy Space Center, Brevard County, Florida

COGNIZANT HEADQUARTERS OFFICE: Office of Space Flight

FY 1989 AND PRIOR YEARS' FUNDING: The following prior years' funding is related to this project:

	Planning and Design	Construction	Total
Specific CoF Funding......................	$100,500	$ ---	$ 100,500
Capitalized Investment..................	---	-37,774,000	97,774,000
Total................................	$100,500	$97,774,000	$97,874,500

SUMMARY PURPOSE AND SCOPE:

This project will replace the three Pad A chillers with new high efficiency units. These improvements will restore reliability to vital environmental control systems for the operation of launch pad facilities.

PROJECT JUSTIFICATION:

The existing chillers at Pad A exceed 21 years of age and have reached the end of their service life. These chillers provide chilled water for the environmental control of various launch pad facilities including the Pad Terminal Connection Room (PTCR), Mobile Launcher Platform (MLP), Payload Changeout Room (PCR), Environmental Control System (ECS) Room, Rotational Service Structure (RSS) and Fixed Service Structure (FSS). Failure of these chillers to generate a sufficient quantity of chilled water could result in a Shuttle launch delay. The cooling load during countdown now exceeds the capacity of two chillers, requiring all three chillers to be on-line to support a launch. This operating condition does not provide the needed redundancy of having to have one chiller available for back-up, and greatly increases the risk of interrupting a launch countdown.

IMPACT OF DELAY:

If these chillers are not replaced in Fiscal Year 1990, their reliability will continue to degrade on an accelerated basis and could result in an extensive system outage during a period of high Shuttle launch activity.

PROJECT DESCRIPTION:

This project replaces three existing 225-ton chillers with three new 300-ton chillers. One new chiller will be located in the remote chiller plant (J8-1707) and two new chillers will be located in Room 107 within the PTCR area (Figure 2). Electrical power, new chilled water pumps, controls and an additional cooling tower cell will also be installed.

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit cost	Cost
Land Acquisition	---	---	---	---
Construction	---	---	---	$1,200,000
Demolition	LS	---	---	56.000
Structural/Civil	LS	---	---	33,000
Mechanical	LS	---	---	325,000
300 Ton Chillers	EA	3	142,000	426,000
Cooling Tower	EA	1	201,000	201,000
Electrical	LS	---	---	159,000
Equipment	---	---	---	---
Fallout Shelter (not feasible)	---	---	---	---
Total				$1,200,000

LIST OF RELATED GRAPHICS:

Figure 1 - Location Plan
Figure 2 - Site Plan
Figure 3 - Plan View

OTHER EQUIPMENT SUMMARY:

None.

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

No future CoF funding anticipated for this project at this time.

JOHN F. KENNEDY SPACE CENTER
FISCAL YEAR 1990 ESTIMATES
REPLACE LAUNCH COMPLEX 39 AND PAD A CHILLERS AND CONTROLS

LOCATION PLAN

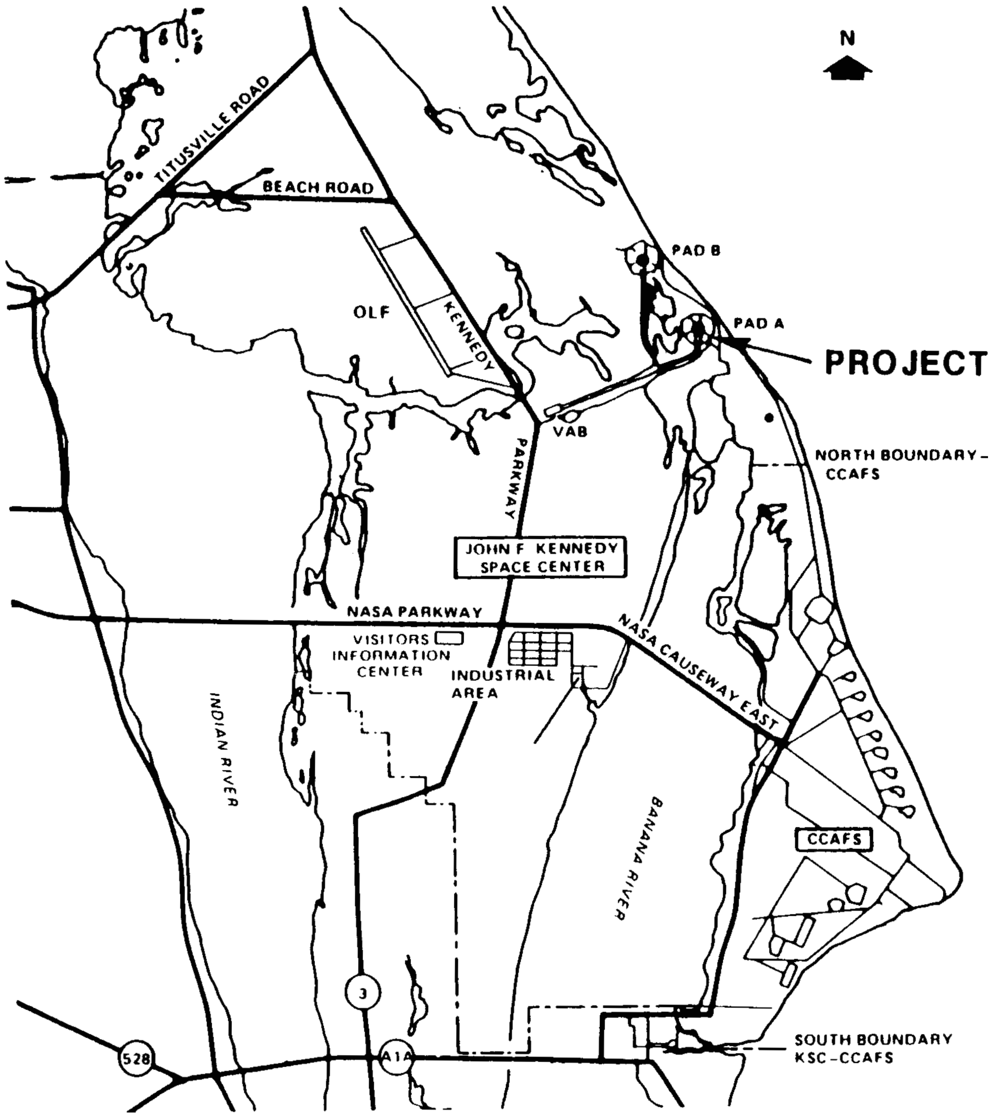


FIGURE 1

JOHN F. KENNEDY SPACE CENTER
FISCAL YEAR 1990 ESTIMATES
REPLACE LAUNCH COMPLEX 39 AND PAD A CHILLERS AND CONTROLS

SITE PLAN

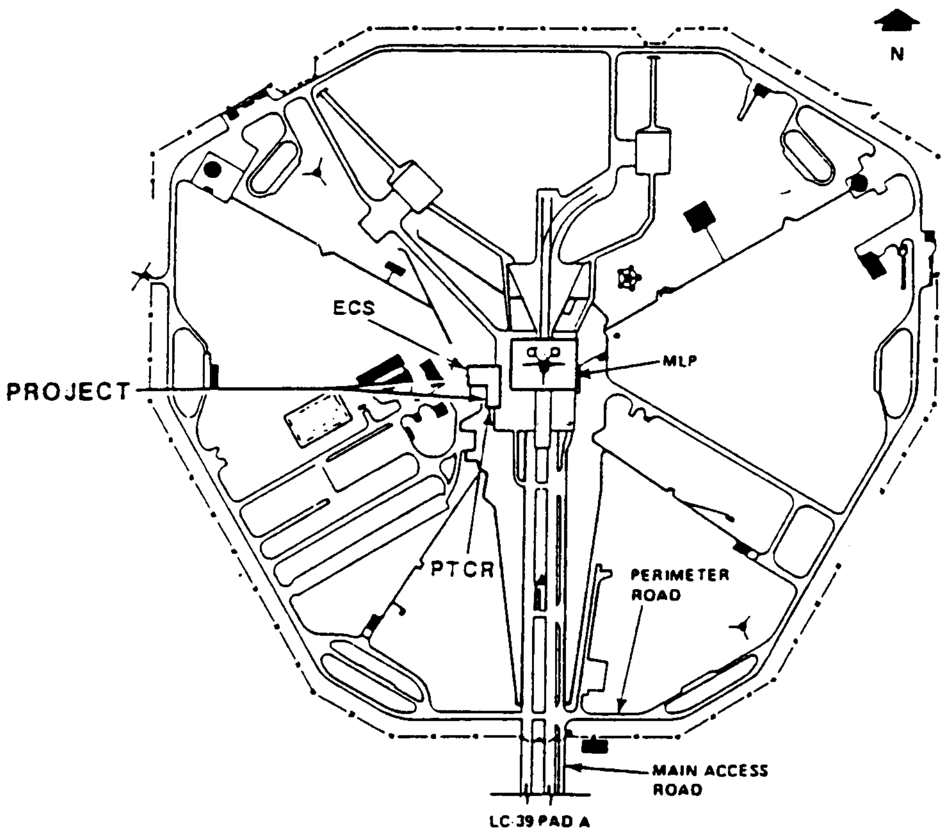


FIGURE 2

JOHN F. KENNEDY SPACE CENTER
FISCAL YEAR 1990 ESTIMATES
REPLACE LAUNCH COMPLEX 39 AND PAD A CHILLERS AND CONTROLS

PLAN VIEW

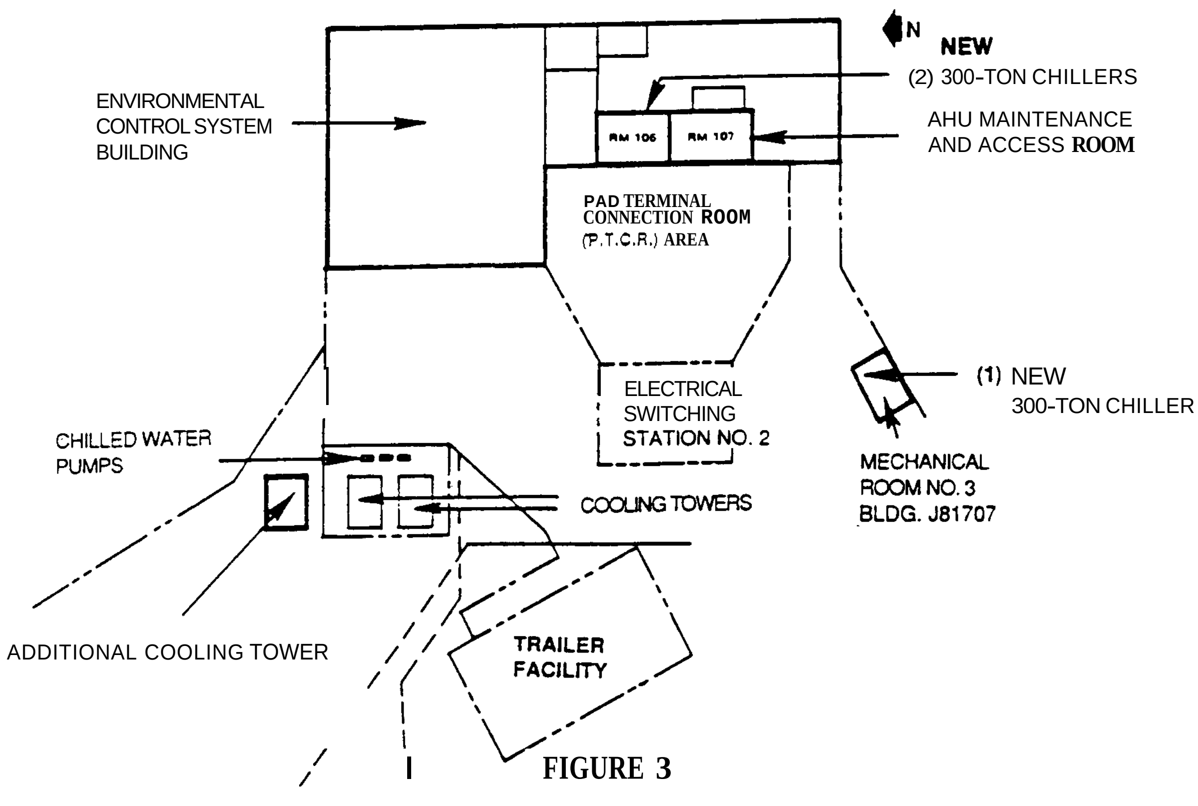


FIGURE 3

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1990 ESTIMATES

PROJECT TITLE: Replace Roofs, Launch Complex 39

INSTALLATION: John F. Kennedy Space Center

FY 1990 CoF Estimate: $11,000,000

LOCATION OF PROJECT: John F. Kennedy Space Center, Brevard County, Florida

COGNIZANT HEADQUARTERS OFFICE: Office of Space Flight

FY 1989 AND PRIOR YEARS' FUNDING: The following prior years' funding is related to this project:

	Planning and Design	Construction	Total
Specific CoF Funding......................	$670,000	--	$ 670,000
Capitalized Investment....................	--	$185,468,793	185,468,793
Total....................................	$670,000	$185,468,793	$186,138,793

SUMMARY PURPOSE AND SCOPE:

This project provides for the replacement of roofs on the Vehicle Assembly Building (VAB) high and low bays and on the contiguous Launch Control Center (LCC) at Launch Complex 39. These facilities directly support and control shuttle launch operations, and the roof repairs are needed to protect valuable flight hardware and ground and launch control equipment housed in these buildings.

PROJECT JUSTIFICATION:

The flat roofs of the VAB and LCC do not drain adequately (Figure 2). Following heavy rains, as much as four inches of water may be standing on large areas of the roofs. When this occurs, defects in the roof's 23-year old water proofing membrane permits water penetration to fully saturate the roof insulation and intrude into fissures in the supporting concrete structural deck. This intrusion has caused some corrosion of reinforcement steel and spalling of concrete which, as it falls, threatens damage to flight hardware and support equipment in the VAB. Roof drainage capability must be improved in both the VAB and LCC to eliminate the effects of standing water. The VAB and LCC are among the most critical and valuable facilities at KSC. It is essential to the success of the Shuttle Program that their roofs be restored to a water tight condition to protect the buildings and their contents.

IMPACT OF DELAY:

Delay in implementing this project will result in further deterioration and increased repair costs. It could impact or delay processing of Shuttle hardware through the VAB due to the risk of falling concrete. Failure to replace the roof of the LCC could also result in water damage to launch critical Ground Support Equipment (GSE) and delay launch schedules.

PROJECT DESCRIPTION:

This project provides for the removal of approximately 324,200 square feet of existing roofing system down to the concrete deck. The existing decks will be repaired, as required, and a new tapered (for rapid drainage) roofing base and additional drains will be installed. Within the-525 foot-high VAB, additional drain pipes (leaders) will be installed from the roof down to ground level to accelerate storm water removal. A new roofing membrane and insulation will be installed with the inclusion of adequate expansion joints.

PROJECT COST ESTIMATE:

This cost estimate is based on a Preliminary Engineering Report.

	Unit of Measure	Quantity	Unit cost	cost
Land Acquisition....................................	---	---	---	---
Construction...	---	---	---	$11,000,000
VAB Roof Repairs (High Bay & portion of Low Bay)....	---	---	---	8,603,000
Demolition.....	SF	260,200	4.32	(1,125,000)
Concrete Repair................................	SF	260,200	.12	(30,000)
Metals & Carpentry..............................	LS	---	---	(351,000)
Roofing...	SF	260,200	16.49	(4,290,000)
Roof Drains....................................	EA	33	32,424	(1,070,000)
Miscellaneous..	LS	---	---	(1,737,000)
LCC Roof Repairs....................................	---	---	---	2,397,000
Demolition......................................	LS	---	---	(396,000)
Metals & Carpentry..............................	LS	---	---	(127,000)
Drains...	EA	9	10,666	(96,000)
Roofing...	SF	64,000	20.33	(1,301,000)
Miscellaneous.	LS	---	---	(477,000)
Equipment...	---	---	---	---
Fallout Shelter (not feasible)......................				
Total.....				$11,000,000

LIST OF RELATED GRAPHICS:

Figure 1 - Location Plan
Figure 2 - Site Plan
Figure 3 - Plan View

OTHER EQUIPMENT SUMMARY:

No other equipment is required **for** this project.

FUTURE COF ESTIMATED FUNDING REQUIRED TO COMPLETE **THIS** PROJECT:

No future CoF funding is anticipated for this project at this time.

JOHN F. KENNEDY SPACE CENTER
FISCAL YEAR 1990 ESTIMATES
REPLACE ROOFS, LAUNCH COMPLEX 39

LOCATION PLAN

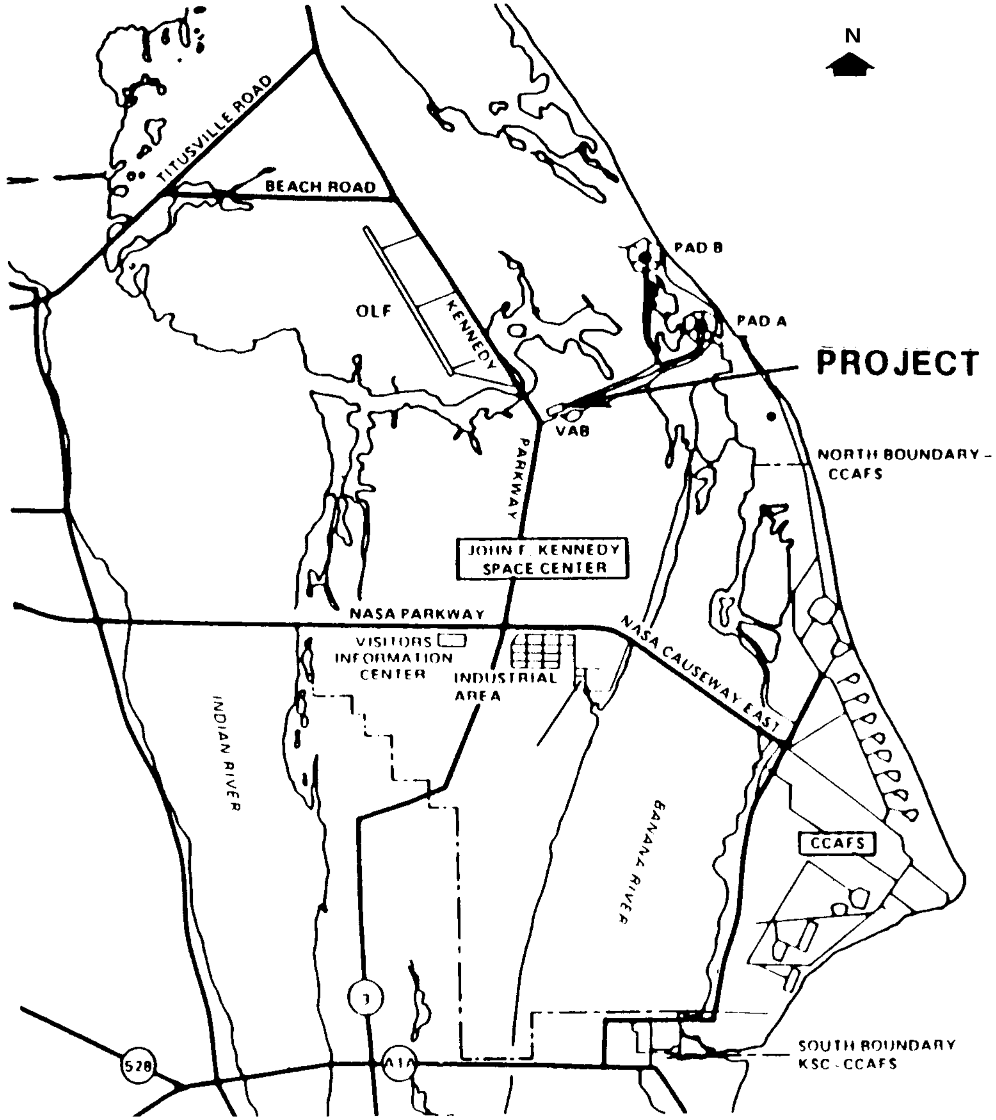


FIGURE 1

JOHN F. KENNEDY SPACE CENTER
FISCAL YEAR 1990 ESTIMATES
REPLACE ROOFS, LAUNCH COMPLEX 39

SITE PLAN

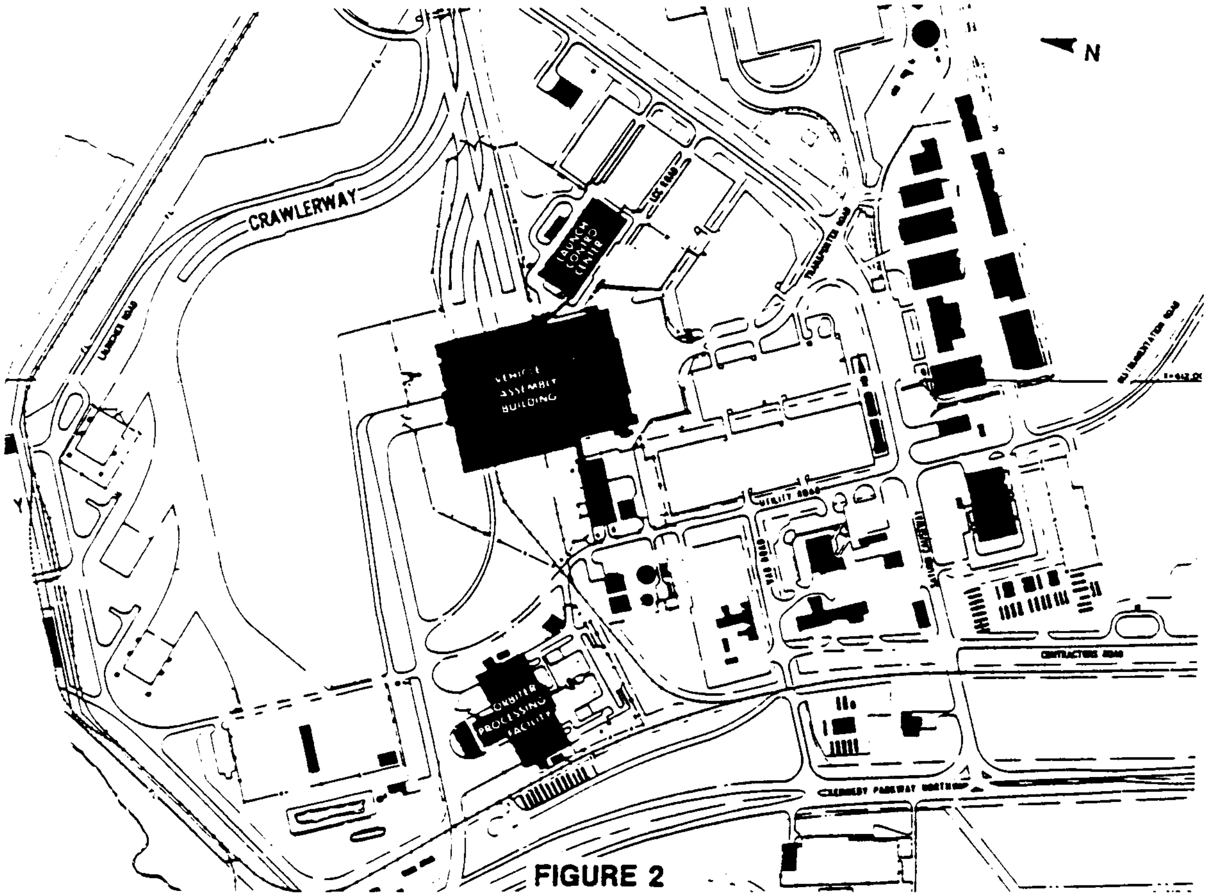


FIGURE 2

JOHN F. KENNEDY SPACE CENTER
FISCAL YEAR 1990 ESTIMATES
REPLACE ROOFS, LAUNCH COMPLEX 39
PLAN VIEW

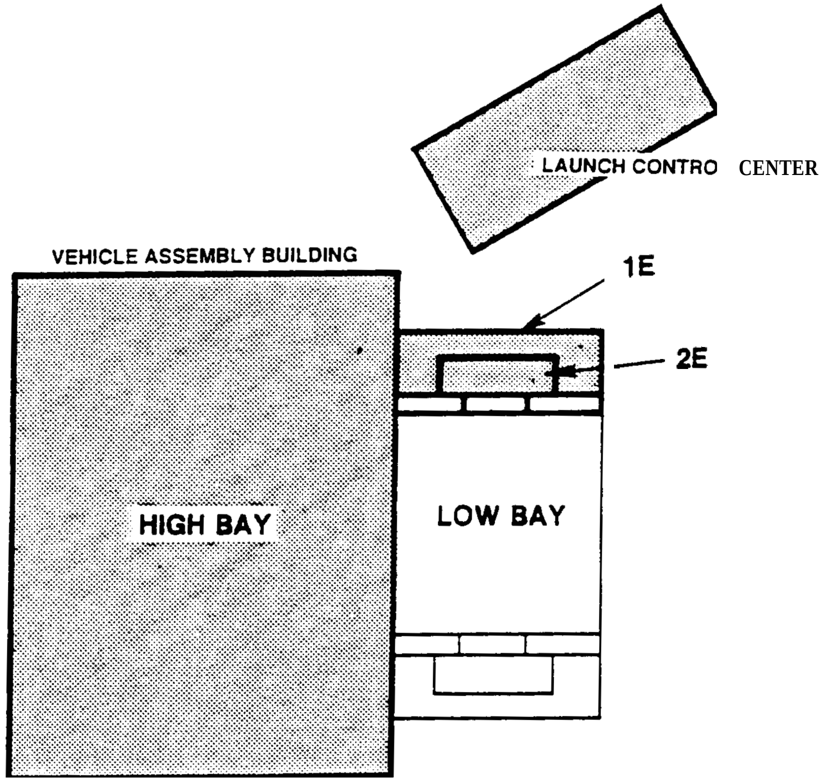


FIGURE 3

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1990 ESTIMATES

PROJECT TITLE: Replace Vehicle Assembly Building Air Handling Units

INSTALLATION: John F. Kennedy Space Center

FY 1990 CoF Estimate: $1,800,000

LOCATION OF PROJECT: John F. Kennedy Space Center, Brevard County, Florida

COGNIZANT HEADQUARTERS OFFICE: Office of Space Flight

FY 1989 AND PRIOR YEARS' FUNDING: The following prior years' funding is related to this project:

	Planning and Design	Construction	Total
Specific CoF Funding......................	$135,000	---	$135,000
Capitalized Investment.........	---	$168,424,251	$168,424,251
Total........	$135,000	$168,424,251	$168,559,251

SUMMARY PURPOSE AND SCOPE:

This project provides for the replacement or refurbishment of 23 air handlers in occupied areas of the Vehicle Assembly Building (VAB) high bay towers to provide reliable systems in support of Shuttle processing.

PROJECT JUSTIFICATION:

The present air handling units are no longer economical to operate, are not reliable, and the cost of maintenance is very high for both manhours and materials. Many spare parts are no longer available. These units will be over 25 years old by the time they are replaced and will have exceeded their normal operational life expectancy. The installation of more efficient units will reduce energy consumption and maintenance costs. Equipment will have a higher level of environmental protection, and performance of equipment and personnel will be improved by optimium temperature/humidity conditions.

IMPACT OF DELAY:

If this project is not approved, the environmental control of the VAB high bay tower areas will be subject to long downtime periods for repair which will adversely impact Shuttle processing.

PROJECT DESCRIPTION:

This project consists of replacing or refurbishing 23 air handling units (Figure 2), associated piping, and electrical power and controls in the following towers of the VAB high bay and areas in the low bay: (Tower or Area Designation--Number of Air Handlers), A-1, B-4, C-2, D-2, E-5, F-3, K-2, L-1, M-2, and N-1.

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit cost	cost
Land Acquisition................................	---	---	---	---
Construction....................................	---	---	---	$1,800,000
Mechanical Air Handlers......	EA	23	71,913	1,654,000
Electrical Systems..........................	LS	---	---	146,000
Equipment.......................................	---	---	---	---
Fallout Shelter (not feasible)..................	---	---	---	---
Total...				$1,800,000

LIST OF RELATED GRAPHICS:

Figure 1 - Location Plan
Figure 2 - Site Plan
Figure 3 - Plan View

OTHER EQUIPMENT SUMMARY:

None.

FUTURE CoF ESTIMATED FUNDING REQUESTED TO COMPLETE THIS PROJECT:

None.

JOHN F. KENNEDY SPACE CENTER
FISCAL YEAR 1990 ESTIMATES
REPLACE VEHICLE ASSEMBLY BUILDING AIR HANDLING UNITS

LOCATION PLAN

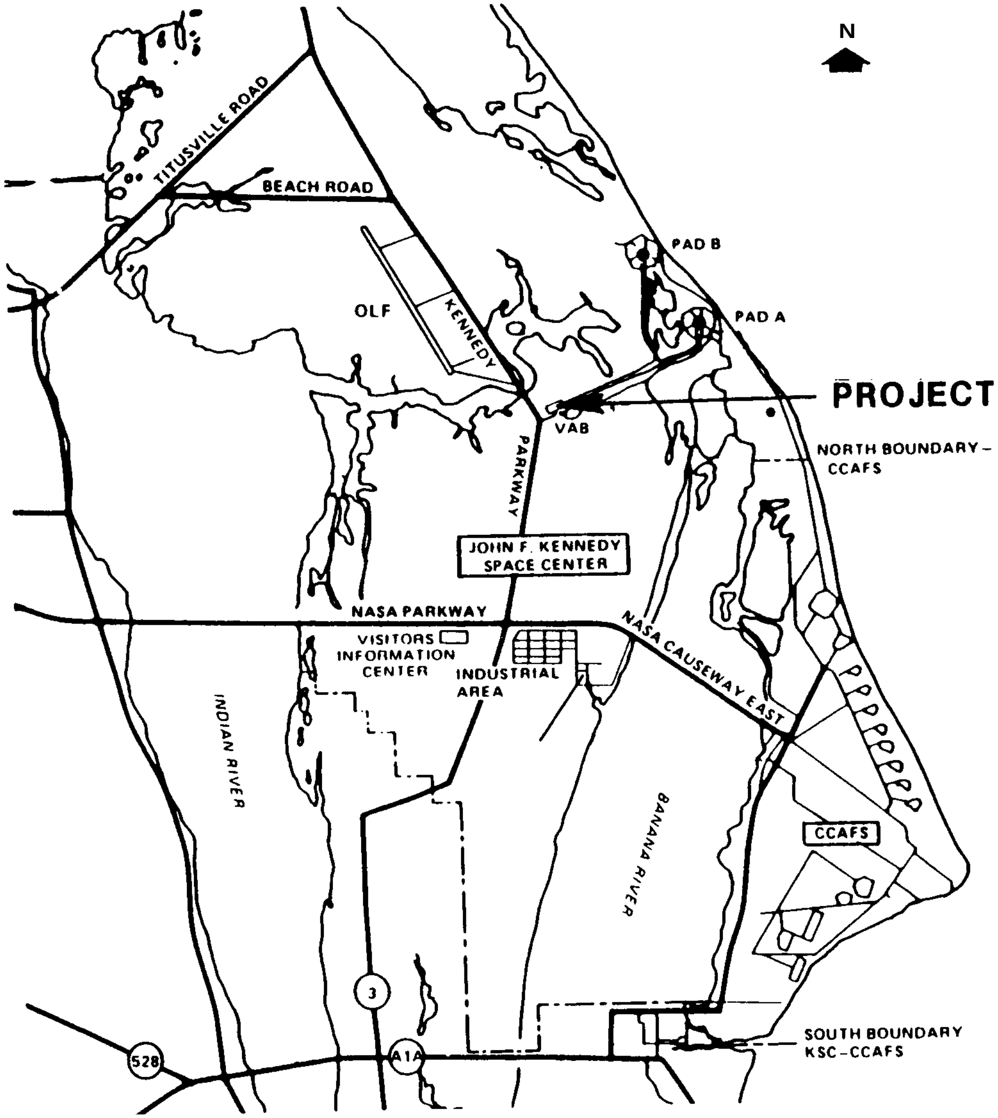


FIGURE 1

JOHN F. KENNEDY SPACE CENTER
FISCAL YEAR 1990 ESTIMATES
REPLACE VEHICLE ASSEMBLY BUILDING AIR HANDLING UNITS
SITE PLAN

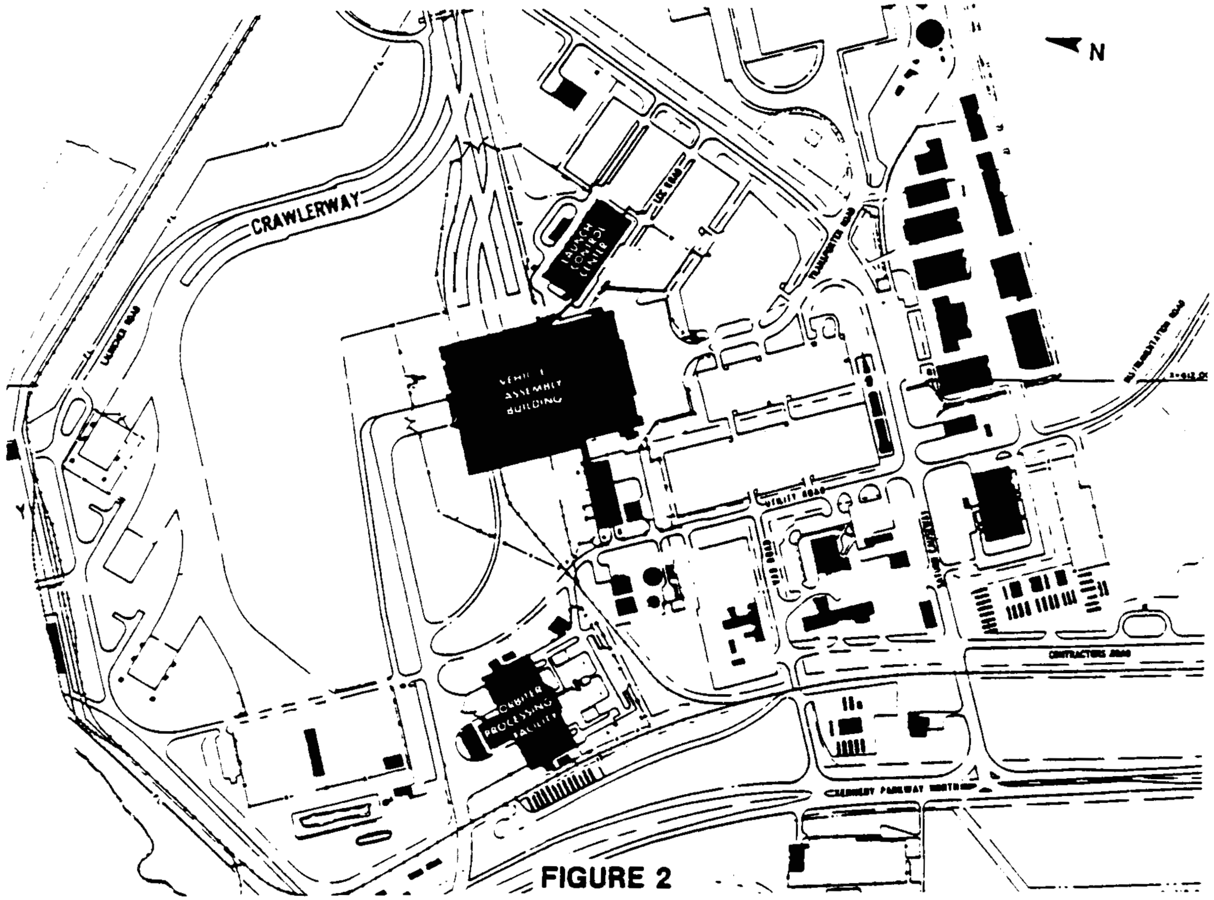


FIGURE 2

JOHN F. KENNEDY SPACE CENTER
FISCAL YEAR 1990 ESTIMATES
REPLACE VEHICLE ASSEMBLY BUILDING AIR HANDLING UNITS
PLAN VIEW

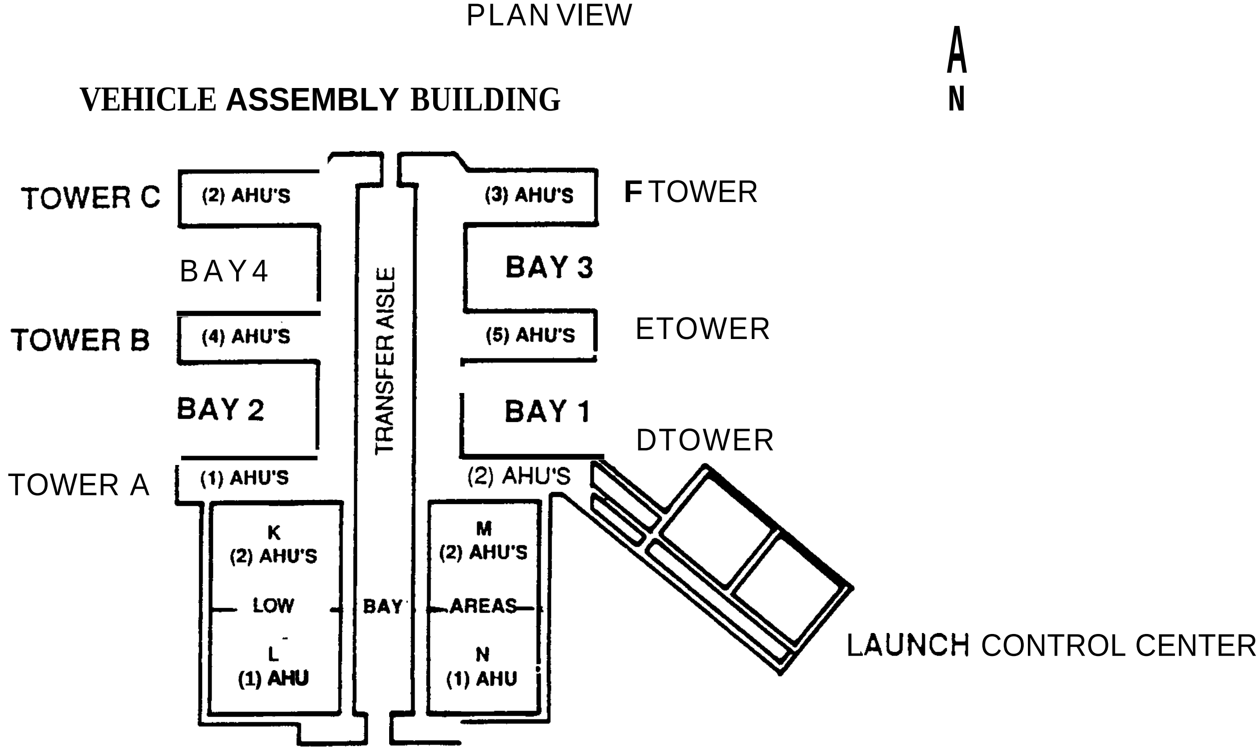


FIGURE 3

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1990 ESTIMATES

PROJECT TITLE: Upgrade Orbiter Modification and Refurbishment Facility to Orbiter Processing Facility #3

INSTALLATION: John F. Kennedy Space Center

FY 1990 CoF Estimate:

LOCATION OF PROJECT: John F. Kennedy Space Center Brevard County, Florida

COGNIZANT HEADQUARTERS OFFICE: Office of Space Flight

FY 1989 AND PRIOR YEARS' FUNDING: The following prior years' funding is related to this project:

	Planning and Design	Construction	Total
Specific CoF funding........ . ..	$2,343,795	$13,300,000	$15,643,795
Capitalized investment............	---	---	---
Total	$2,343,795	$13,300,000	$15,643,795

SUMMARY PURPOSE AND SCOPE:

This project provides a third orbiter processing bay and support space by upgrading the existing Orbiter Modification and Refurbishment Facility (OMRF) to a fully outfitted and augmented orbiter processing facility configuration. This is necessary so that Kennedy Space Center (KSC) can satisfy the processing requirements, structual inspections and other safety procedures required by the recommendations of the Challenger accident [illegible] and still be able meet the anticipated flight rates.

PROJECT JUSTIFICATION:

Upon returning from a space mission, an orbiter must undergo safing, deservicing, maintenance and checkout before it can be readied for reuse. The significant Orbiter Processing Facility (OPF) operations include draining and purging all fuel systems, removing ordnance and all other hazardous elements, removing payloads brought back from space, inspecting the payload bay and crew cabin, repairing and replacing damaged components and refurbishing the thermal protection system. The hypergolic modules are also serviced. After these operations are completed, the orbiter is prepared for the next flight, the mission payloads are inserted into the payload bay and then moved to the Vehicle Assembly Building (VAB) for stacking operations.

Prior to the 53.-L accident, the two existing bays of the OPF and the ORMF were sufficient to accomplish the above. However, post 51-L test and checkout requirements have increased OPF processing times for added safety, reducing the annual turnaround per bay capacity. In addition, in 1991, the replacement (fourth) orbiter will be delivered to KSC, requiring extended use of an OPF bay for initial checkout and activation, further complicating processing activities.

To process the orbiters with the increased post 51-L requirements, and to effectively utilize the four orbiter fleet and achieve the anticipated launch rate, a third OPF bay is a mandatory requirement.

IMPACT OF DELAY:

Shuttle manifest and operational schedules are dependent on sufficient processing capacity. If the capability to process the full orbiter fleet is not brought on line, Shuttle turnaround times and the anticipated launch rates will be adversely impacted.

PROJECT DESCRIPTION:

This project upgrades the OMRF (Figure 2) to OPF #3 by constructing, modifying and installing an orbiter access system, safing and deservicing capability, and additional 30 ton-crane and orbiter processing equipment and support systems. This includes capability for hypergols deservicing, gaseous and liquid hydrogen, gaseous and liquid oxygen, gaseous nitrogen and helium systems, hydraulic and ground coolant piping, electrical, communications, instrumentation and control cabling. These systems will be routed through an under-floor trench system to Orbiter workstations. The project includes construction of a multi-story annex (Figures 3 and 4) enclosing approximately 34,000 gross square feet to provide a central marshalling/locker area for technical and quality control personnel and office space for approximately 175 processing support personnel.

PROJECT COST ESTIMATE:

The basis of this cost estimate is an in-house engineering estimate.

	Unit of Measure	Quantity	Unit cost	cost
Land Acquisition....................................	---	---	---	---
Construction..	---	---	---	$ 5,520,000
Site development/Utilities..........................	LS	---	---	555,000
Elect. Duct Banks & Power Upgrade..................	LS	---	---	233,000
Contamination Control..............................	LS	---	---	500,000
Building/Structural.................................	SF	34,000	68.47	2,328,000
Building/Mechanical & Electrical Systems.............	SF	34,000	56.00	1,904,000
Equipment..	---	---	---	20,480,000
Construct, Modify and Install Orbiter Access System.....................................	---	---	---	15,347,000
Hypersol Deservicing System.........................	LS	---	---	850,000
Gaseous Hydrogen & Oxygen System....................	LS	---	---	324,000
Liquid Oxygen & Hydrogen System.....................	LS	---	---	788,000
Gaseous Nitrogen Systems............................	LS	---	---	456,000
Gaseous Helium Systems..............................	LS	---	---	361,000
Ground Coolant System Piping........................	LS	---	---	227,000
Environmental Control System Ducting.................	LS	---	---	552,000
Compressed Air System...............................	LS	---	---	259,000
Hydraulic System....................................	LS	---	---	402,000
30-Ton Bridge Crane.................................	EA	1	914,000	914,000
Fallout Shelter (not feasible)......................	---	---	---	---
Total..				$26,000,000

LIST OF RELATED GRAPHICS:

Figure 1 - Location Plan
Figure 2 - Site Plan
Figure 3 - Perspective
Figure 4 - Plan View

OTHER EQUIPMENT SUMMARY

The OPF #3, will need approximately $60,000,000 of noncollateral equipment, i.e. scrubbers, tanks, hoses, fittings, purge connections, cable plants and hardware interface module (HIM) to be funded with Space Flight Control and Data Communication resources.

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

No future CoF funding is anticipated for this project at this time.

JOHN F. KENNEDY SPACE CENTER
FISCAL YEAR 1990 ESTIMATES
UPGRADE ORBITER MODIFICATION AND REFURBISHMENT FACILITY TO ORBITER PROCESSING FACILITY #3

LOCATION PLAN

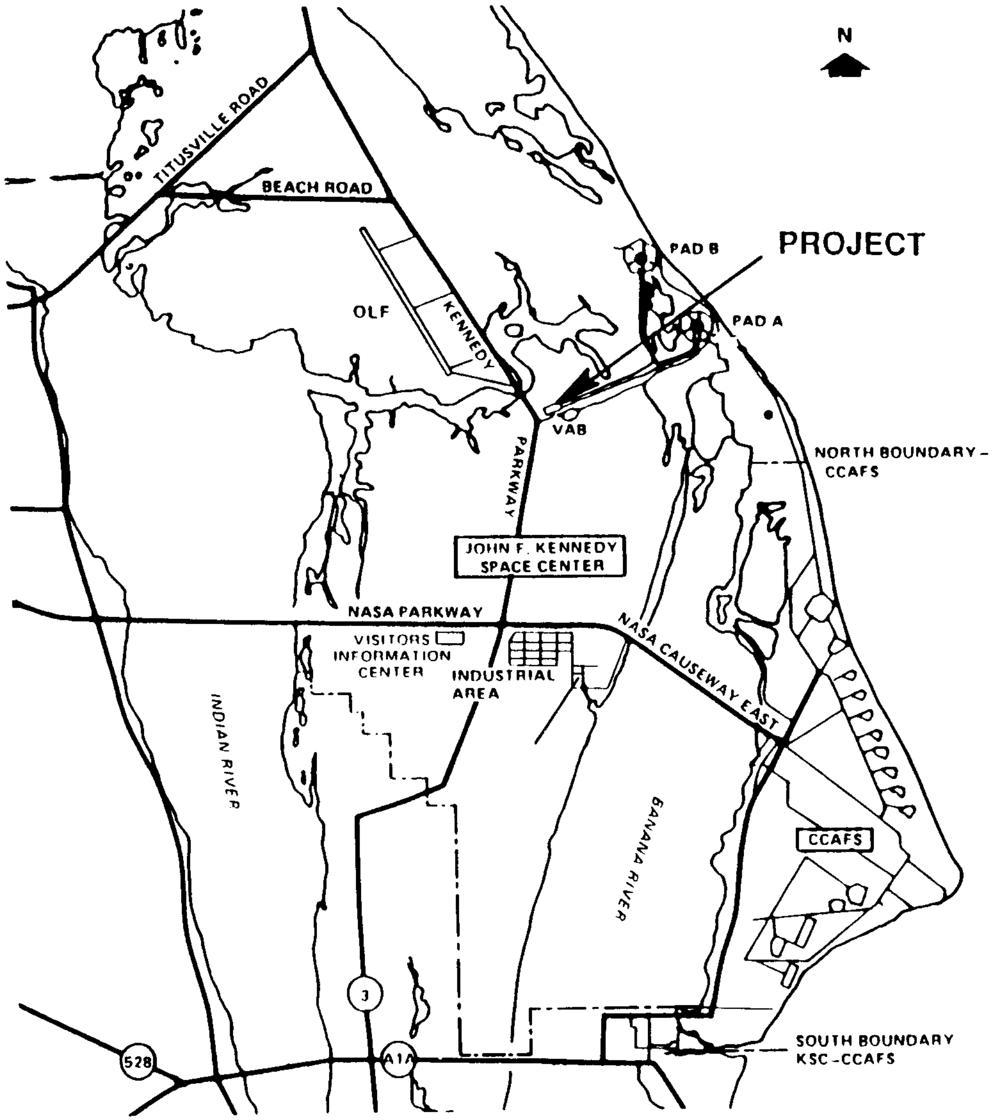


FIGURE 1

JOHN F. KENNEDY SPACE CENTER
FISCAL YEAR 1990 ESTIMATES
UPGRADE ORBITER MODIFICATION AND REFURBISHMENT FACILITY TO
ORBITER PROCESSING FACILITY #3

SITE PLAN

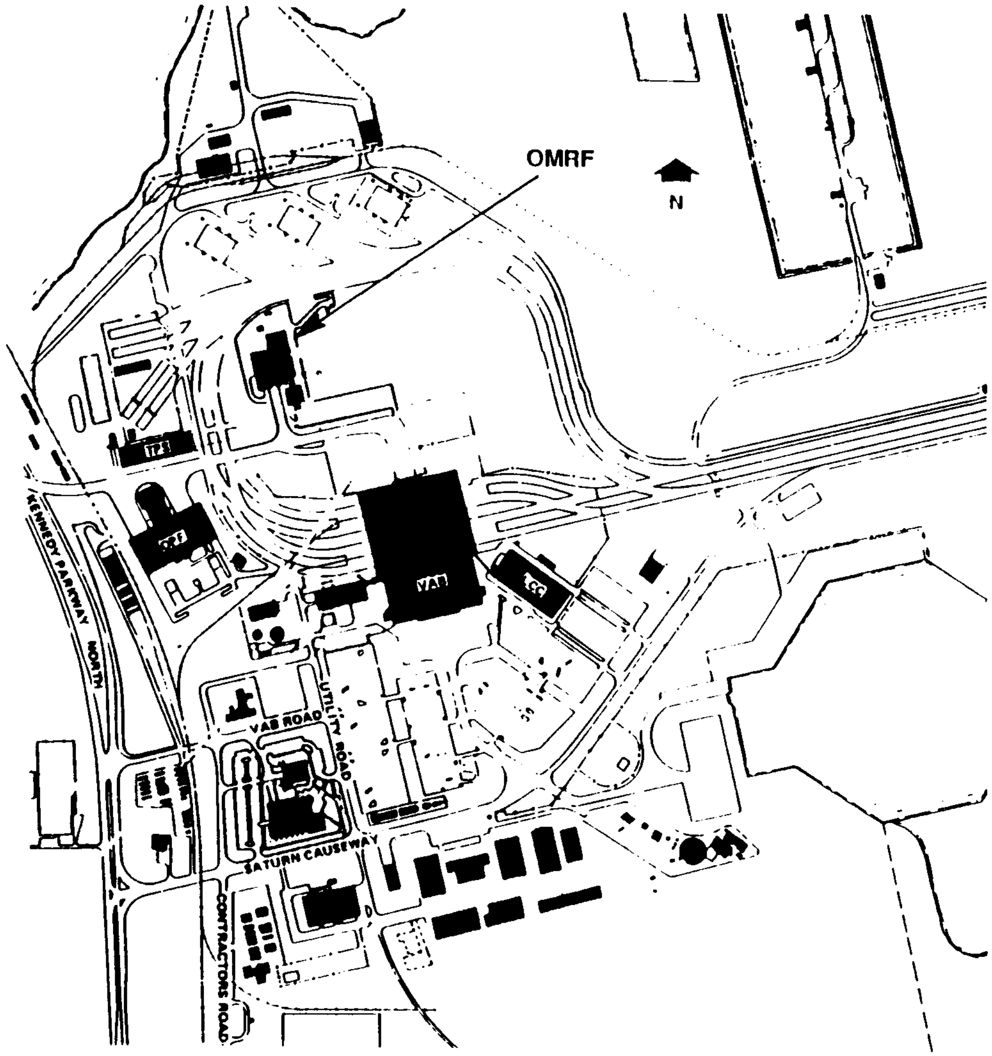


FIGURE 2

JOHN F. KENNEDY SPACE CENTER
FISCAL YEAR 1990 ESTIMATES
UPGRADE ORBITER MODIFICATION AND REFURBISHMENT
FACILITY TO ORBITER PROCESSING FACILITY NO. 3

PERSPECTIVE

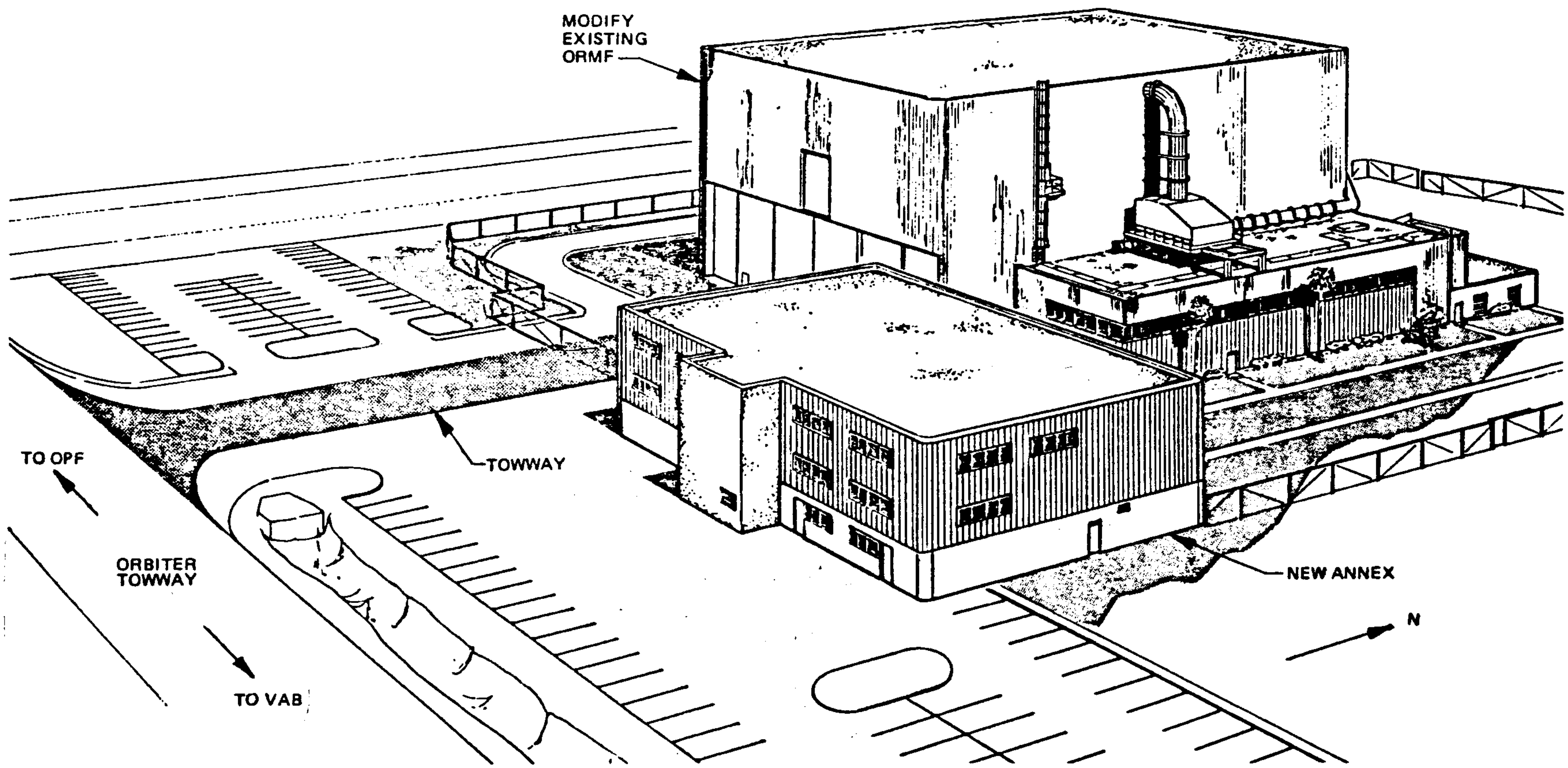


FIGURE 3

JOHN F. KENNEDY SPACE CENTER
FISCAL YEAR 1990 ESTIMATES
UPGRADE ORBITER MODIFICATION AND REFURBISHMENT
FACILITY TO ORBITER PROCESSING FACILITY NO. 3

PLAN VIEW

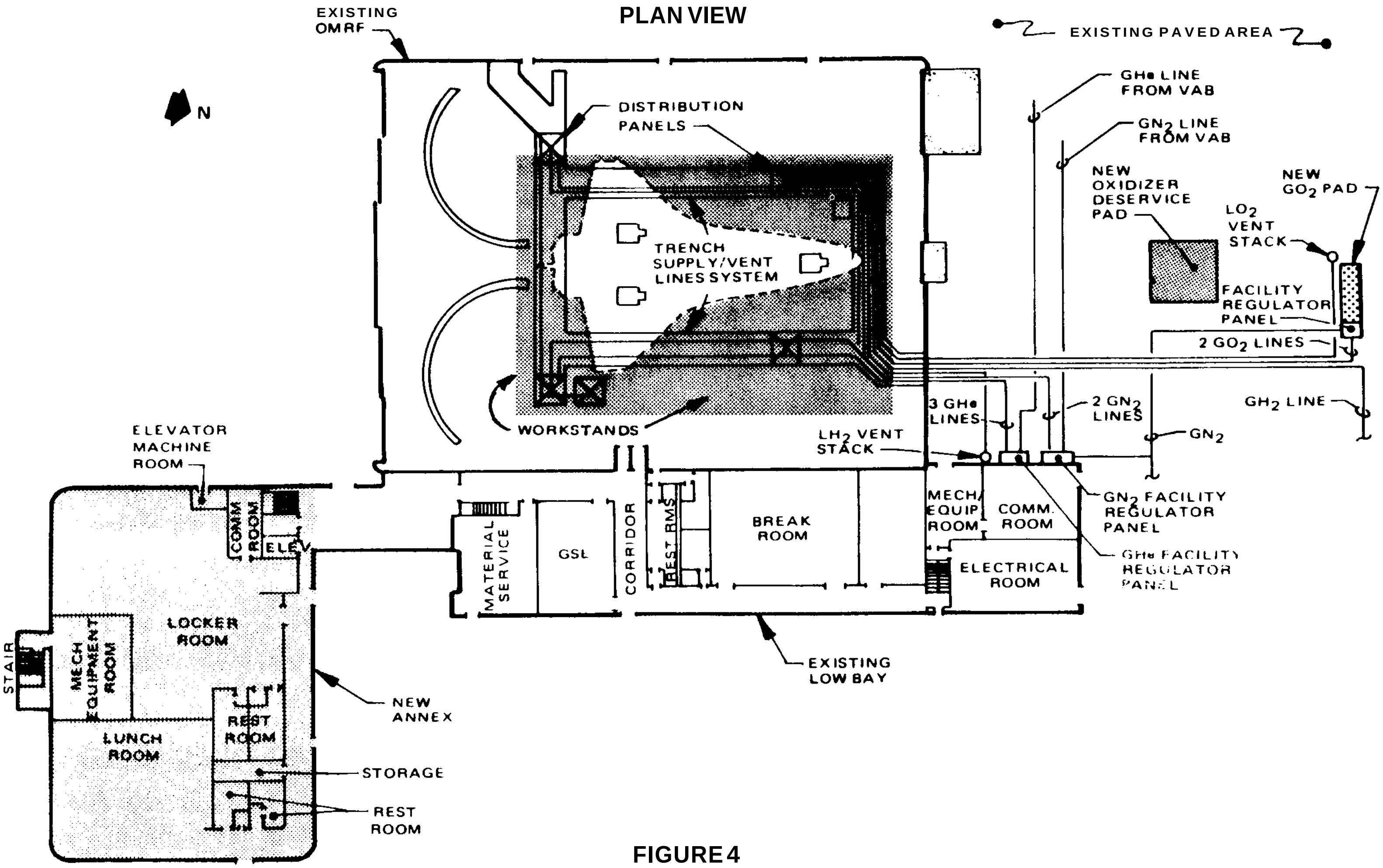


FIGURE 4

PROJECT TITLE: Modification of High Pressure Industrial Water System

INSTALLATION: John C. Stennis Space Center

FY 1990 CoF Estimate: $2,000,000

LOCATION OF PROJECT: Stennis Space Center, Hancock County, Mississippi

COGNIZANT HEADQUARTERS OFFICE: Office of Space Flight

FY 1989 AND PRIOR YEARS' FUNDING: The following prior years' funding is related to this project:

	Planning and Design	Construction	Total
Specific CoF Funding	$136,000	$ ---	$ 136,000
Capitalized Investment	---	$11,317,810	$11,317,810
Total	$136,000	$11,317,810	$11,453,810

SUMMARY IRPOSE AND 'E:

This project provides a new makeup water system for the High-pressure Industrial Water (HPIW) Reservoir. The decline of Artesian water pressure from existing wells requires that the reservoir be replenished with water from the access canal. This water is used to support the static firing of the Space Shuttle main engines.

PROJECT JUSTIFICATION:

Current HPIW reservoir makeup pumping capacity was designed for no more than two firings per quarter. Current Space Shuttle Main Engine (SSME) program operations require a testing frequency of up to 15 static firings per month, substantially increasing makeup water demand. Recent geological studies and surveys indicate that the underground aquifer from which Stennis Space Center (SSC) receives its supply has reduced its flow by approximately 50 percent with the reduction trend continuing from over usage. This aquifer depletion is a problem not limited only to SSC but to the entire Mississippi coastal area. It is becoming a serious concern. To alleviate supply concerns and to mitigate the coastal depletion of water, it is imperative that existing SSC pumping efforts from this aquifer be minimized. This project will provide needed pumping capacity so that water can be drawn from the canal.

IMPACT OF DELAY:

Delay of this project will cause the aquifer depletion to continue with the eventual reduction of needed water supplies.

PROJECT DESCRIPTION:

A new pump station will be constructed on the main canal south of the existing HPIW reservoir as shown on Figure 1. A portion of the canal will be enlarged to accommodate the pump station and four 5,000 gpm motor driven pumps (three operating and one spare) will be installed on structural steel beams supported by steel piles. Motor starters and monitoring instrumentation will be included for the pump drives with decking and platforms provided for access to the pumps. The side of the enlarged canal will be supported by steel piles. A new header will be installed between the pump station and the existing HPIW reservoir. Electrical power wiring and control signal wiring from the HPIW facility will be provided along with an access road and walkway from the HPIW facility to the new pump station.

PROJECT COST ESTIMATE:

The basis of this cost estimate is an engineering study.

	Unit of Measure	Quantity	Unit cost	cost
Land Acquisition	---	---	---	---
Construction				$2,000,000
Site Work	LS	---	---	460,000
Concrete	LS	---	---	80,000
Structural Steel	LS	---	---	350,000
Mechanical	LS	---	---	860,000
Electrical	LS	---	---	160,000
Control Systems	LS	---	---	go, 000
Equipment	---	---	---	---
Fallout Shelter (not feasible)	---	---	---	---
Total				$2,000,000

LIST OF RELATED GRAPHICS:

Figure 1 - Site Plan
Figure 2 - Project Site

OTHER EQUIPMENT SUMMARY:

No other equipment will be required to support this project.

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

No future CoF funding is anticipated for this at this time.

STENNIS SPACE CENTER
FISCAL YEAR 1990 ESTIMATE
MODIFICATION OF HIGH-PRESSURE INDUSTRIAL WATER SYSTEM
SITE PLAN

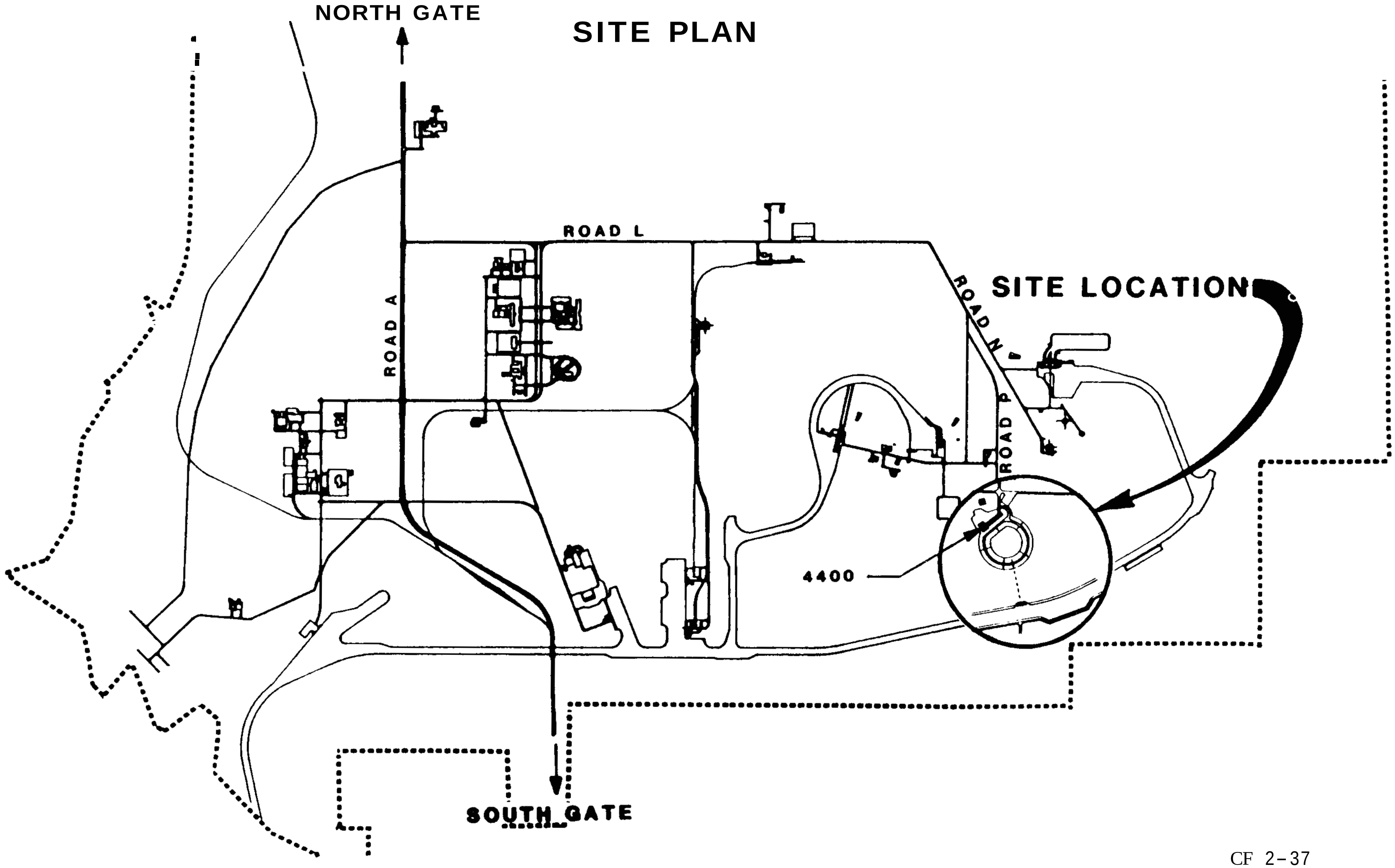
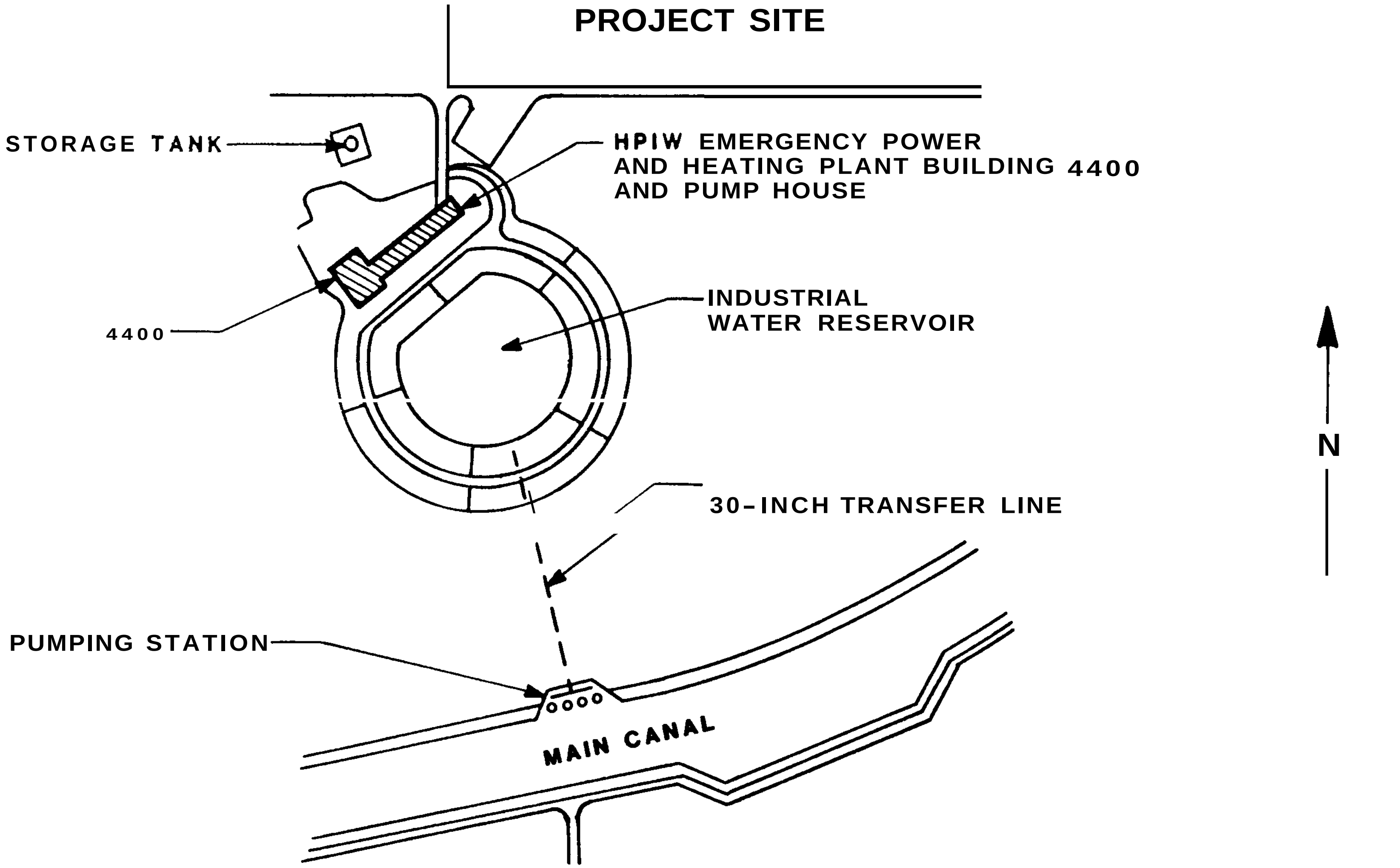


FIGURE 1

STENNIS SPACE CENTER

FISCAL YEAR 1990 ESTIMATE
MODIFICATION OF HIGH-PRESSURE INDUSTRIAL WATER SYSTEM

PROJECT SITE



CF 2-38

FIGURE 2

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1990 ESTIMATES

PROJECT TITLE: Replacement of High Pressure Gas Storage Vessels

INSTALLATION: John C. Stennis Space Center

FY 1990 CoF Estimate: $3,000,000

LOCATION OF PROJECT: Stennis Space Center, Hancock County, Mississippi

COGNIZANT HEADQUARTERS OFFICE: Office of Space Flight

FY 1989 AND PRIOR YEARS' FUNDING: The following prior years' funding is related to this project:

	Planning and Design	Construction	Total
Specific CoF Funding	$190,000	$ 3,500,000	$ 3,690,000
Capitalized Investment	---	108,957,031	108,957,031
Total	$190,000	$112,457,031	$112,647,031

SUMMARY PURPOSE AND SCOPE:

This project will complete the replacement of deteriorated High-pressure Gas Storage Vessels in the "B" Test Complex that are used to furnish gases for the Space Shuttle Main Engine (SSME) Testing Program. Existing gas storage vessels have been removed from service or are operating on safety standards waivers requiring pressure derating. One 1,500-cubic feet (CF) gaseous nitrogen (GN_2) storage vessel will be replaced with two 750-CF high-pressure gas storage vessels.

PROJECT JUSTIFICATION:

The Stennis Space Center (SSC) Pressure Vessel Recertification Program has identified severe deterioration in several vessels in the "B" Test Complex supporting the SSME Program. Safety standards require that these vessels be derated below the originally designed maximum allowable working pressure or be removed from service. In FY 1989, one 1,500-CF GN_2 storage vessel and one 600-CF gaseous hydrogen (GH_2) storage vessel are being replaced with two 750-CF and one 600-CF high pressure gas storage vessel. This project will complete the replacement and conversion of deteriorated tanks and provide the needed gas storage capabilities to support testing.

The Test Complex Pressure Vessels were fabricated in 1964 and have been in continuous service since that time. These vessels are used for storage of gases up to 6,000 pounds per square inch guage (psig). The vessels, of laminated construction, are fabricated from High Strength (HS)-1A (T-1) steel. The properties of this steel make it highly susceptible to stress corrosion cracking and requires replacement at this time.

IMPACT OF DELAY:

Continued deterioration of the remaining vessels is causing continued derating of maximum working pressure or removal from service. This is causing a continued reduction in usable storage capacity which, if not corrected, will result in an inability to continue the SSME test program at SSC. This would shortly result in an inability to fly the Shuttle because of the lack of replacement main engines.

PROJECT DESCRIPTION:

The work includes procurement of two 750-CF GN_2 vessels with a maximum allowable working pressure of up to 6,500 psig; installation of a vessel support structure; modification of interconnecting piping; and chemical cleaning and testing of the vessels and modified system. The downrated 1,500-CF GN_2 vessel will be converted to high-pressure air to provide better operational efficiency for air drying of the SSME test articles.

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	cost
Land Acquisition	---	---	---	---
Construction	---	---	---	$3,000,000
GN_2 Storage Vessel (750 CF + Freight)	EA	2	$1,390,000	2,780,000
Site Preparation, Installation, Piping and Valves..	LS	---	---	220,000
Equipment	---	---	---	---
Fallout Shelter (not feasible)	---	---	---	---
Total				$3,000,000

LIST OF RELATED GRAPHICS:

Figure 1 - Site Plan
Figure 2 - "B" Test Complex

OTHER EQUIPMENT SUMMARY:

No other equipment will be required to support this project.

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

No future CoF funding is required to complete this project.

STENNIS SPACE CENTER
FISCAL YEAR 1890 ESTIMATE
REPLACEMENT OF HIGH-PRESSURE GAS STORAGE VESSELS

SITE PLAN

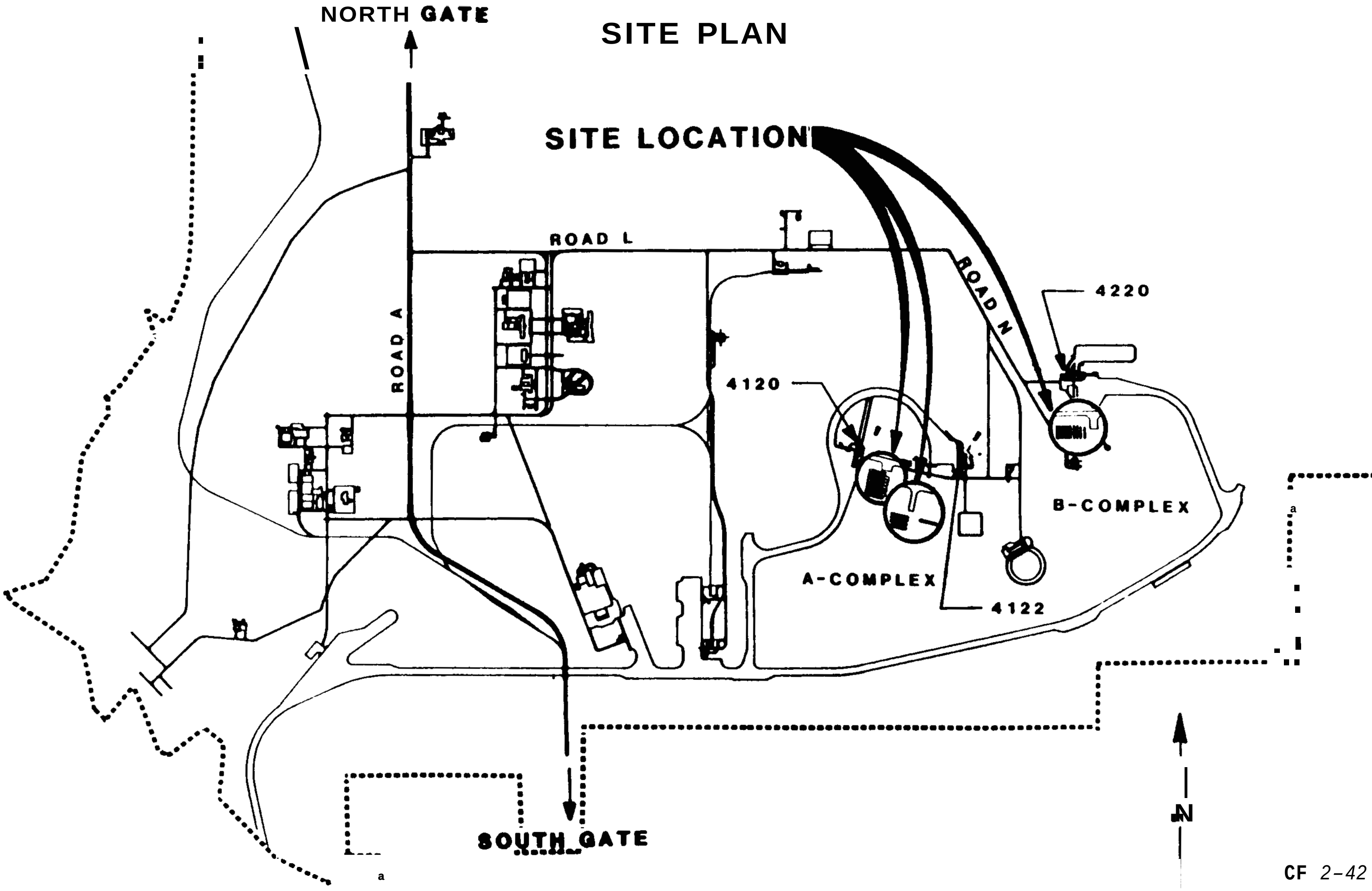
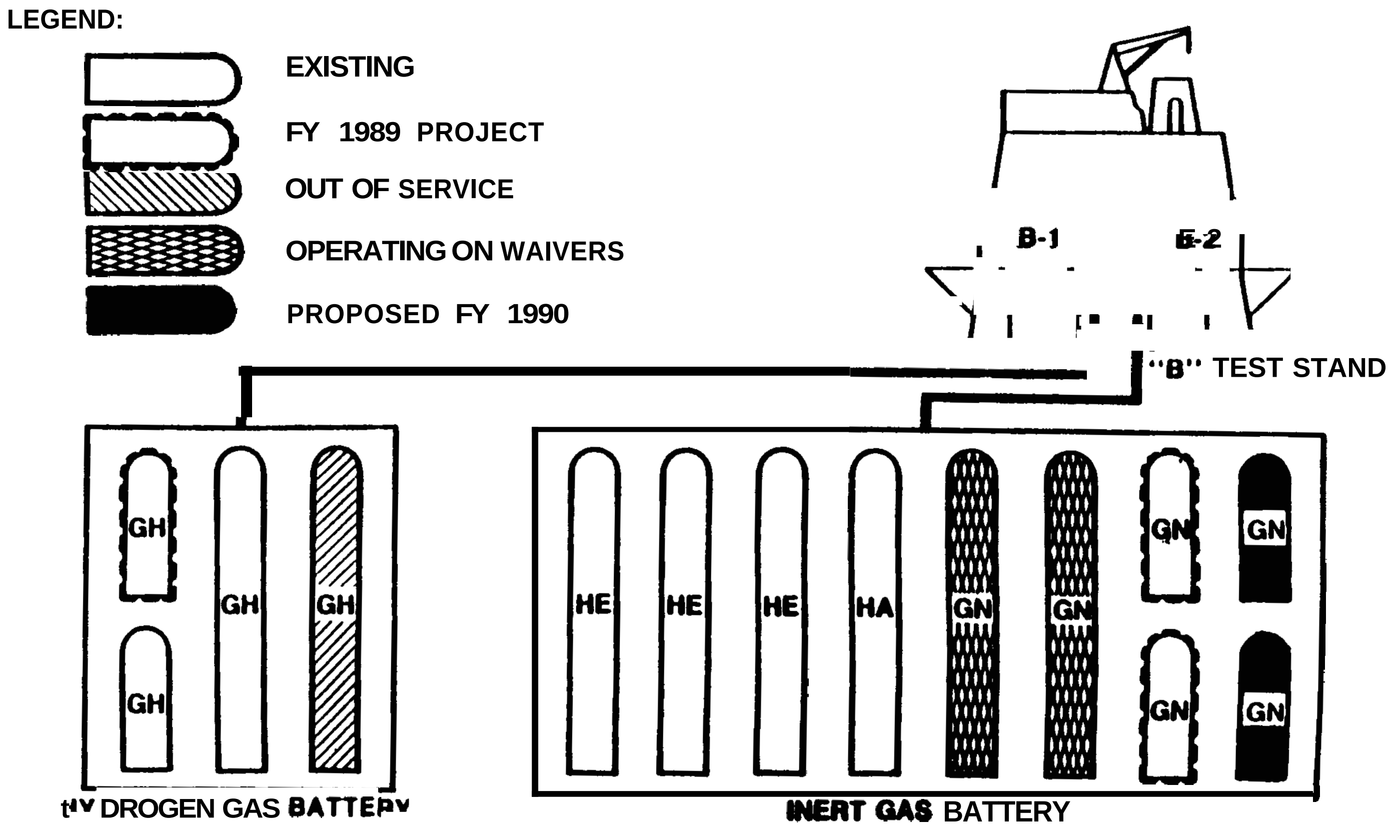


FIGURE 1

STENNIS SPACE CENTER

FISCAL YEAR 1990 ESTIMATE
REPLACEMENT Of HIGH-PRESSURE GAS STORAGE VESSELS



"B" TEST COMPLEX

FIGURE 2

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1990 ESTIMATES

PROJECT TITLE: Construction of National Resource Protection

INSTALLATION: Various Installations

FY 1990 CoF Estimate: $3,800,000

LOCATION OF PROJECT: Various Locations

COGNIZANT HEADQUARTERS OFFICE: Office of Space Flight

FY 1989 AND PRIOR YEARS' FUNDING: The following prior years' funding is related to this project:

	Planning and Design	Construction	Total
Specific CoF Funding	$342,000	$2,600,000	$2,942,000
Capitalized Investment	---	---	---
Total	$342,000	$2,600,000	$2,942,000

SUMMARY PURPOSE AND SCOPE:

This project continues security protection for the Space Transportation System (STS) hardware and related facilities which have been designated as vital national resources at the John F. Kennedy Space Center (KSC), Dryden Flight Research Facility (DFRF), Stennis Space Center (SSC), and the Michoud Assembly Facility (MAF). This protection includes construction of fencing, vehicle barriers, guardhouses, and perimeter lighting to protect all designated vital STS assets against sabotage, damage, and theft.

PROJECT JUSTIFICATION:

Presidential Decision Memorandum Number 37 (National Space Policy, 1978), Presidential Directive/National Security Council, Number 42 (Civil and Further National Space Policy, 1978), and National Security Decision Directive Number 42 (National Space Policy, July 4, 1982) contain policy designating Space systems and support systems as vital national resources. This designation specifically referenced the Space Transportation System (STS) assests, and required that the survivability of these assets be assured in order to be available for military, scientific, and research uses. STS survivability requires that protective measures be in place at all times to ensure proper, efficient, and effective operation. This project will provide for category "B" resources, which, if lost could result in STS program delay up to 6 months. Funding to protect category "A" resources which, if lost, could cause the loss of an orbiter or crew or would result in a STS program delay greater than 6 months, was provided in the FY 1989 CoF Budget.

IMPACT OF DELAY:

Delay of this project increases the vulnerability of National Resources to adversaries. Lack of protective facilities increases the requirement for security manpower and the exposure of assets to physical harm.

PROJECT DESCRIPTION:

This project provides for construction of seven-foot-high double chainlink fencing, three-strand barbed wire, concertina wire, automatic gates, vehicle barriers, guardhouses, perimeter lighting, and all electrical work needed to support the lighting, guardhouses, and automatic gates at facilities listed.

At Kennedy Space Center, additional fencing and lighting will be installed at the Orbiter Modification and Refurbishment Facility, Operations and Checkout Building, Vertical Processing Facility, Shuttle Landing Facility, Utility Annex and other essential operation facilities in the Launch Complex 39 (LC-39) area. In addition, vehicle barriers will be installed at Pads A and B in LC-39, the Orbiter Processing Facility and the Vehicle Assembly Building (VAB). Hardened guardhouses will be installed at several facilities in the VAB area.

At Michoud Assembly Facility, additional fencing will be installed along the eastern and southern perimeter.

At Stennis Space Center, additional fencing, access gates, vehicle barriers and lighting will be installed to protect the Test Complex "A" and "B", Space Shuttle Main Engine (SSME) Engine Service Building, Data Acquisition Facility, the canal, lock and bridge area, and other test essential facilities.

At Dryden Flight Research Facility, additional fencing and lighting will be installed to protect the STS facilities.

PROJECT COST ESTIMATE:

This cost estimate is based on an engineering study.

	Unit of Measure	Quantity	Unit cost	cost
Land Acquisition	---	---	---	---
Construction	---	---	---	$3,800,000
Fencing and miscellaneous	LS	---	---	2,016,000
Vehicle Barriers	LS	---	---	660,000
Perimeter lights	LS	---	---	480,000
Electrical work and controls	LS	---	---	524,000
Guardhouses	LS	---	---	120,000
Equipment	---	---	---	---
Fallout Shelter (not feasible)	---	---	---	---
Total				$3,800,000

LIST OF RELATED GRAPHICS:

None

OTHER RELATED FUNDING:

In the research and program management appropriation there is $6.4 million in FY 1989 and $5.0 in FY 1990 for related equipment and services.

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

CoF resources may be required in FY 1991 and subsequent years to provide for additional security protection for STS and other facilities designated as a vital national resource.

KENNEDY
SPACECENTER

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1990 ESTIMATES

SUMMARY

JOHN F. KENNEDY SPACE CENTER

	Amount	Page No.
Office of Space Flight:		
Refurbish Bridges, Merritt Island..................................	4,500,000	CF 3-1
Rehabilitation of Spacecraft Assembly and Encapsulation Facility 11.	3,500,000	CF 3-6
Total...	8,000,000	

t

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1990 ESTIMATES

PROJECT TITLE: Refurbish Bridges, Merritt Island

INSTALLATION: John F. Kennedy Space Center

FY 1990 CoF Estimate: $4,500,000

LOCATION OF PROJECT: John F. Kennedy Space Center, Brevard County, Florida

COGNIZANT HEADQUARTERS OFFICE: Office of Space Flight

FY 1989 AND PRIOR YEARS' FUNDING: The following prior years' funding is related to this project:

	Planning and Design	Construction	Total
Specific CoF Funding	$270,000	---	$ 270,000
Capitalized Investment	--	$8,123,682	8,123,682
Total	$270,000	$8,123,682	$8,393,682

SUMMARY PURPOSE AND SCOPE:

This project provides for the repair and refurbishment of the Jay-Jay Railroad Bridge and the three highway bridges: the Indian River Bridge, the Banana River Bridge and the Haulover Canal Bridge. These bridges provide the primary access to Kennedy Space Center (KSC), and their continuous availability is vital to center operations.

PROJECT JUSTIFICATION:

Refurbishment of the Jay-Jay Railroad Bridge spanning the Indian River is necessary to prevent further deterioration and to ensure delivery of Solid Rocket Booster (SRB) segments for Shuttle, Trident and Titan missions to KSC and Cape Canaveral Air Force Station (CCAFS). There are no alternate methods of delivery for the SRB segments at the present time. A recent inspection revealed general deterioration of major and minor concrete and steel structural bridge members and made recommendations as to refurbishment and repair.

The Indian River Bridge provides vehicular access over the Intercoastal Waterway for KSC and areas west of the center (Orlando, Titusville, Cocoa, etc.) for personnel, tourists and services, amounting to approximately 17,000 vehicles per day. Recent inspections revealed significant deterioration of various structural elements such as pilings, pile bents, prestressed concrete beams, pile cap tie-back rods, and fenders.

Refurbishment of the Banana River Bridge is necessary to preclude structural failures that could disrupt road and waterway traffic and block one of the major entrances to KSC and access to CCAFS. This bridge is also used for transporting Solid Rocket Booster hardware and launch payloads.

Refurbishment of the Haulover Canal Bridge is necessary to preclude structural failures that could disrupt road and waterway traffic and block one of the major entrances to KSC. Approximately 3,000 vehicles use this bridge everyday.

All of the highway bridges have been in continuous operation for over 20 years and have been subject to vigorous vibration, water/humidity intrusion and stress.

IMPACT OF DELAY:

There are no contingency routes for SRB segments if the railroad bridge is not in reliable condition. Continued use aggravates the existing conditions, and can only result in further deterioration and consequent downgrading of the safe load carrying capability.

The highway bridges are now operational but deterioration of the structures is continuing and could cause a failure in the foreseeable future. In addition, if the proposed refurbishment is delayed, the possibility of injury to personnel/equipment increases and the structural condition will violate Coast Guard regulations and Florida statutes.

PROJECT DESCRIPTION:

Refurbishment of the Jay-Jay Railroad Bridge consists of cleaning spalls/cracks in the concrete substructure and patching with moisture insensitive epoxy grout, replacing bulkhead tie rods, repairing bulkhead piles/caps, and restoring approaches/embankments. After sandblasting the 53 steel bridge spans and the bascule span superstructure, a thorough inspection will be made to determine which spans require replacement. Those judged to be structurally inadequate will be replaced. The remaining spans will be recoated with appropriate protective materials.

Refurbishment of the three highway bridges includes work to both the concrete and steel structure. The Banana River and Haulover Canal Bridges work also includes the wing wall parapets, trunion pedestals, bascule piers and fenders and replacement of the bridge grid steel deck. Pilings, prestressed concrete beams, pile caps, deck joints, fender pilings, equipment pedestals, interfacing electrical equipment and miscellaneous other items will be reworked and brought to a reliable, more maintainable condition.

PROJECT COST ESTIMATE:

The basis of the cost estimate is a KSC in-house engineering estimate.

	Unit of Measure	Quantity	Unit cost	Cost
Land Acquisition	---	---	---	---
Construction	---	---	---	$4,500,000
Jay-Jay Railroad Bridge	---	---	---	2,170,000
Structural Repairs	LS	---	---	(1,690,000)
Sandblasting	LS	---	---	(250,000)
Protective Recoating	LS	---	---	(230,000)
Indian River Bridge	---	---	---	1,370,000
Structural Repairs	LS	---	---	(1,150,000)
Mechanical Repairs	LS	---	---	(220,000)
Banana River Bridge	---	---	---	570,000
Structural Repairs	LS	---	---	(450,000)
Mechanical Repairs	LS	---	---	(120,000)
Haulover Canal Bridge	---	---	---	390,000
Structural Repairs	LS	---	---	(260,000)
Mechanical Repairs	LS	---	---	(130,000)
Equipment	---	---	---	---
Fallout Shelter (not feasible)	---	---	---	---
Total				$4,500,000

LIST OF RELATED GRAPHICS:

Figure 1 - Location Plan

OTHER EQUIPMENT SUMMARY:

None.

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

No future funding is required to complete this project.

JOHN F. KENNEDY SPACE CENTER
FISCAL YEAR 1990 ESTIMATES
REFURBISH BRIDGES MERRITT ISLAND
LOCATION PLAN

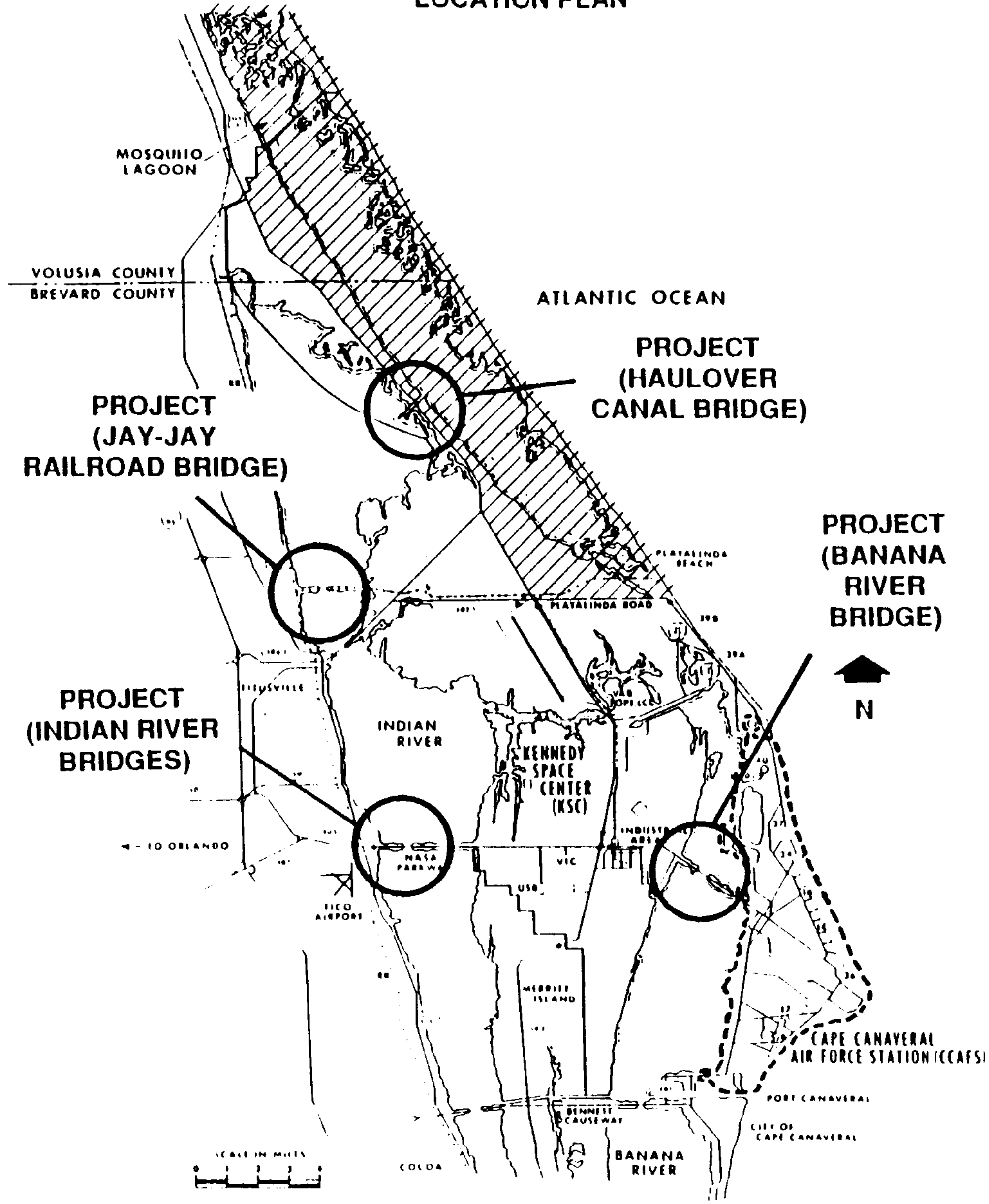


FIGURE 1

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1990 ESTIMATES

PROJECT TITLE: Rehabilitation of Spacecraft Assembly and Encapsulation Facility II

INSTALLATION: John F. Kennedy Space Center

FY 1990 CoF Estimate: $3,500,000

LOCATION OF PROJECT: John F. Kennedy Space Center, Brevard County, Florida

COGNIZANT HEADQUARTERS OFFICE: Office of Space Flight

FY 1989 AND PRIOR YEARS' FUNDING: The following prior years' funding is related to this project:

	Planning and Design	Construction	Total
Specific CoF Funding....................	$ 210,000	---	$ 210,000
Capitalized Investment..................	---	5,323,531	5,323,531
Total................................	$ 210,000	$5,323,531	$5,533,531

SUMMARY PURPOSE AND SCOPE:

This project provides for the rehabilitation of the Spacecraft Assembly and Encapsulation Facility II (SAEF-11) air-conditioning system and roof. All chillers and air handling units (AHU), associated piping, ductwork and controls will be replaced in a more energy-efficient and maintainable configuration, which will reduce the risk of damage to payloads being processed.

PROJECT JUSTIFICATION:

The SAEF-II facility was completed in 1966 (Figures 2 and 3). The existing roof-mounted AHU's are beyond life expectancy range, and have severely deteriorated due to the harsh salt air environment. Reliability for support of payload customers with critical equipment will be jeopardized without AHU replacement. In addition, the present mounting of the units on platforms above the roof makes roof maintenance nearly impossible. Installation of new energy-efficient AHU's on free-standing structures is the only alternative to assure access to the roof for proper maintenance. The five 24-year old chillers and controls are worn out and obsolete, require constant maintenance and have replacement parts that are difficult if not impossible, to obtain. Replacement of these systems and roof is necessary to restore reliability to this critical payload hazardous processing facility.

IMPACT OF DELAY:

Delay of this project has the potential of delaying processing and launch of Space Shuttle payloads.

PROJECT DESCRIPTION:

This project will replace ten existing AHU's with eight new units located on free-standing steel platforms adjacent to the building, install associated ductwork and chilled/hot water piping, and state-of-the-art controls with a programmable logic controller (Figure 4). The existing equipment platforms on the roof will be removed, allowing direct access to the underlying roof. The existing built-up roofing system will be removed and replaced with new insulation and built-up roofing. The five existing chillers and pumps will be replaced with two 300-ton chillers and two pumps inside the building. A new two-cell cooling tower and motor control center will be provided to complete the project.

PROJECT COST ESTIMATE:

The basis of this cost estimate is KSC Estimating Guide and recent construction bids.

	Unit of Measure	Quantity	Unit cost	cost
Land Acquisition	--	--	--	--
Construction				$3,500,000
Demolition	SF	2,000	68.50	137,000
Asbestos Removal	LS	--	--	100,000
Re-Roof Facility	SF	18,300	11.09	203,000
Platform Structures	LS	--	--	436,000
AHU's, Piping, Ducts	LS	--	--	1,578,000
Elec Power & Controls	LS	--	--	1,016,000
Site Work	LS	--	--	30,000
Total				$3,500,000

LIST OF RELATED GRAPHICS:

Figure 1 - Location View
Figure 2 - Site Plan
Figure 3 - Aerial Photograph
Figure 4 - Plan View

OTHER EQUIPMENT SUMMARY:

Other equipment, estimated at $510,000 such as Hypergolic Fuel and Oxidizer Scrubbers to be funded from Research and Development (R&D) resources will be required to support SAEF-II operations.

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

No future CoF funding for this project anticipated at this time.

JOHN F. KENNEDY SPACE CENTER
FISCAL YEAH 1990 ESTIMATES
REHABILITATION OF SPACECRAFT ASSEMBLY AND ENCAPSULATION FACILITY II

LOCATION PLAN

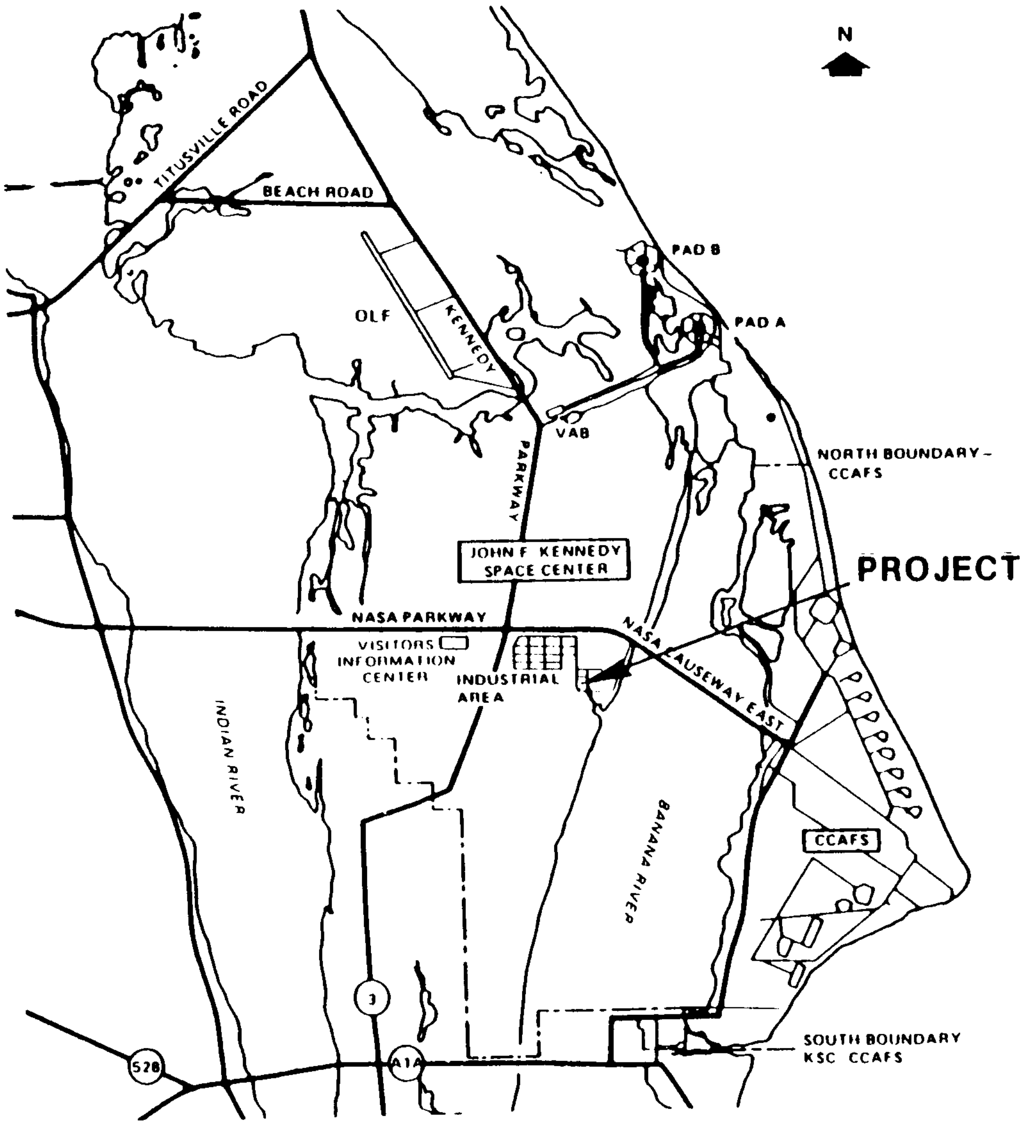
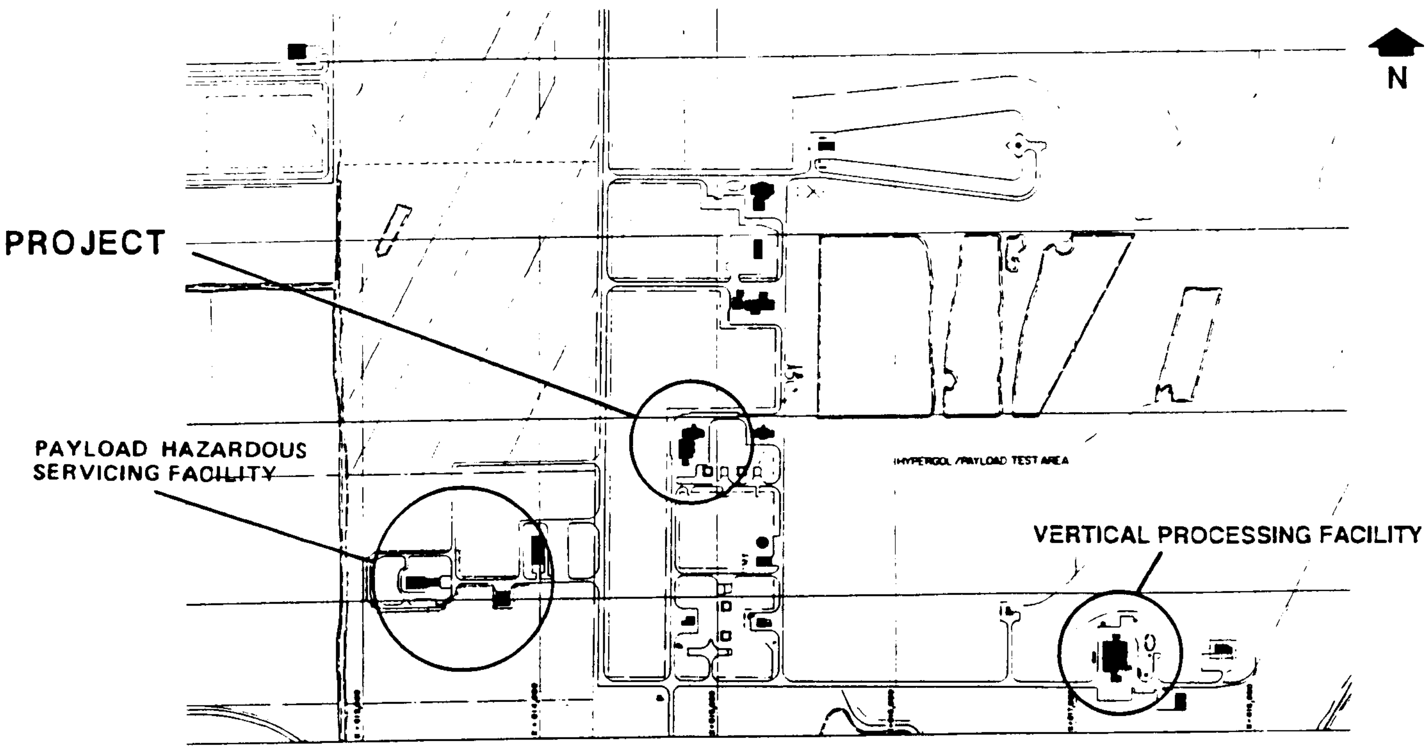


FIGURE 1

JOHN F. KENNEDY SPACE CENTER
FISCAL YEAR 1990 ESTIMATES
REHABILITATION OF SPACECRAFT ASSEMBLY AND ENCAPSULATION
FACILITY II
SITE PLAN



SOUTH EAST INDUSTRIAL AREA

FIGURE 2

JOHN F. KENNEDY SPACE CENTER
FISCAL YEAR 1990 ESTIMATES
REHABILITATION OF SPACECRAFT ASSEMBLY AND ENCAPSULATION
FACILITY II

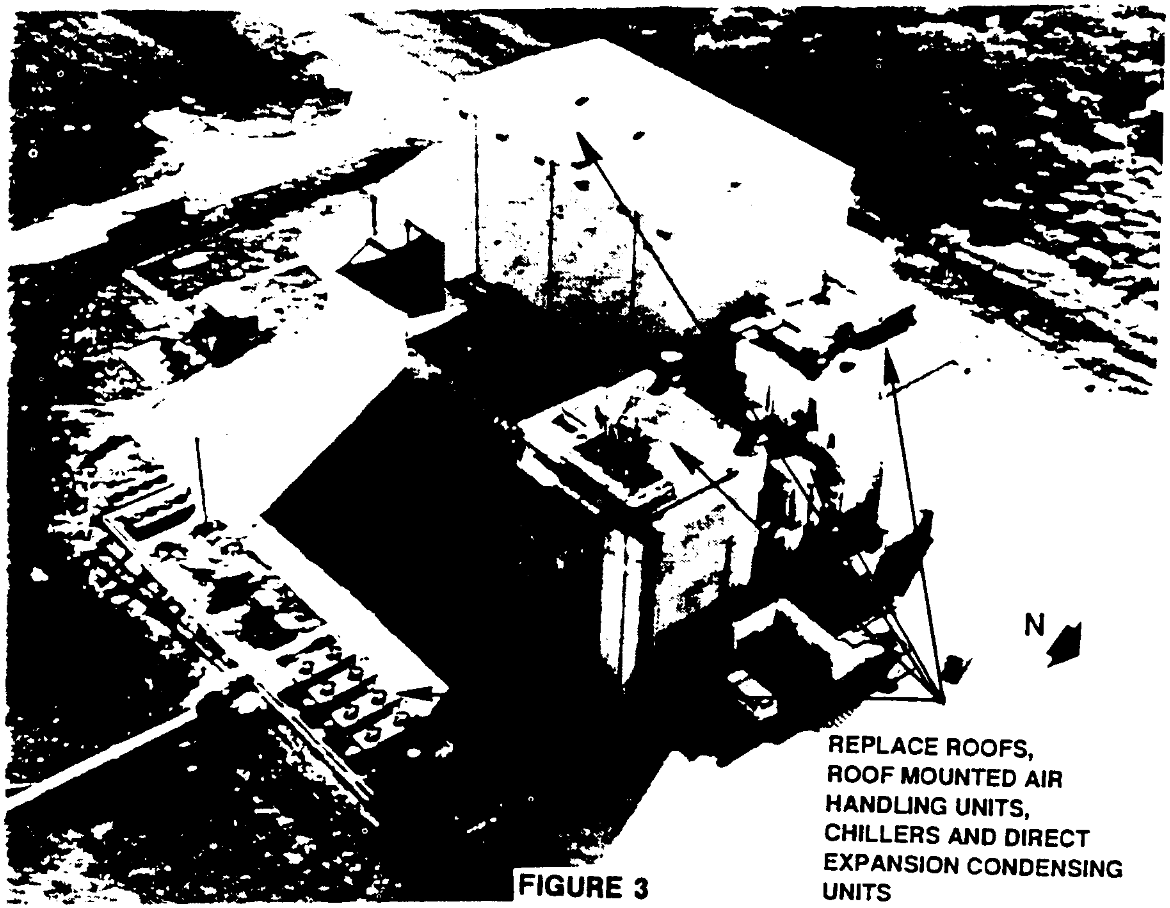


FIGURE 3

JOHN F. KENNEDY SPACE CENTER
FISCAL YEAR 1990 ESTIMATES
REHABILITATION OF SPACECRAFT ASSEMBLY AND ENCAPSULATION FACILITY II

ROOF PLAN

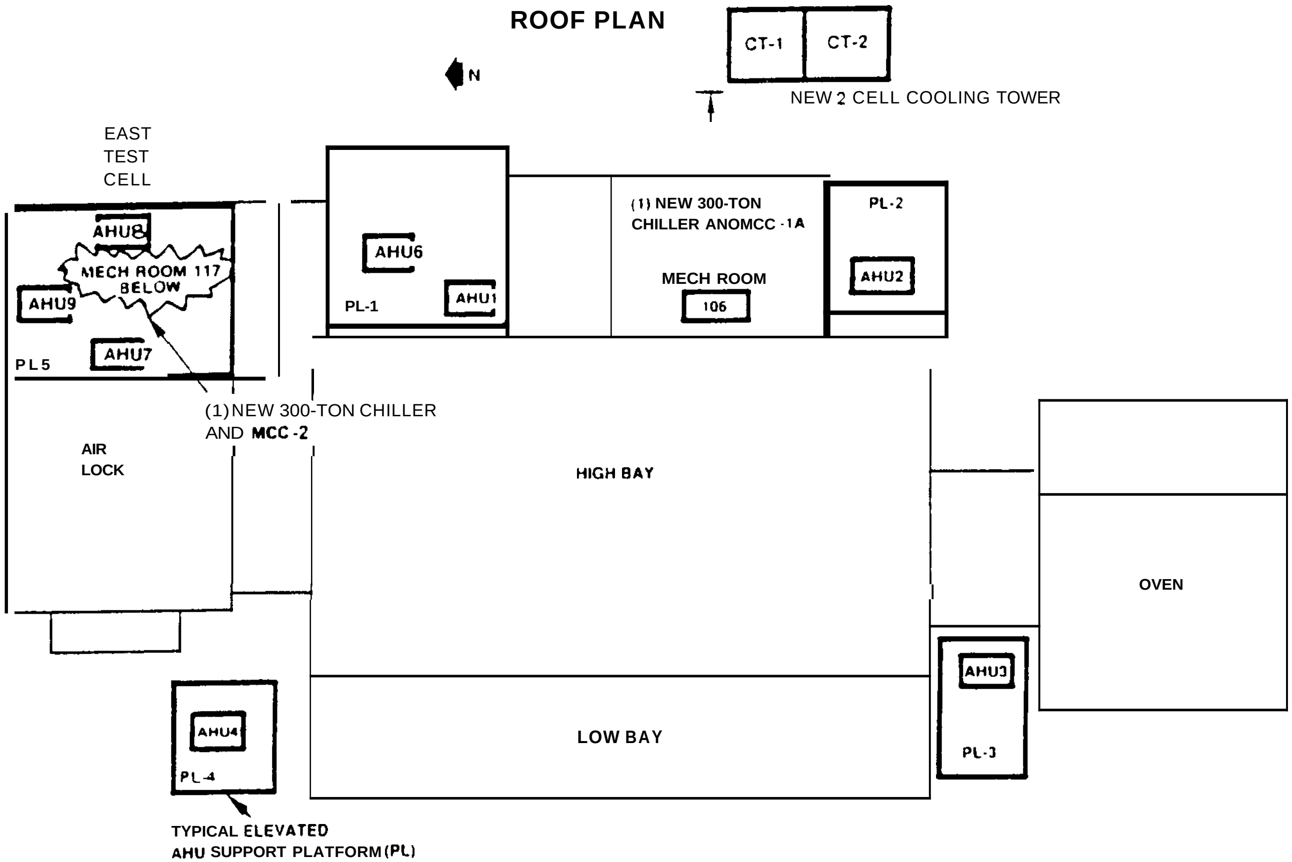


FIGURE 4

JOHNSON
SPACE CENTER

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1990 ESTIMATES

SUMMARY

LYNDON B. JOHNSON SPACE CENTER

	Amount	Page No.
Office of Space Flight:		
Rehabilitation of Central Heating/Cooling Plant	2,800,000	CF 4-1

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1990 ESTIMATES

PROJECT TITLE: Rehabilitation of Central Heating/Cooling Plant (24)

INSTALLATION: Lyndon B. Johnson Space Center

FY 1990 CoF Estimate: $2,800,000

LOCATION OF PROJECT: Houston, Harris County, Texas

COGNIZANT HEADQUARTERS OFFICE: Office of Space Flight

FY 1989 AND PRIOR YEARS' FUNDING: The following prior years' funding is related to this project:

	Planning and Design	Construction	Total
Specific CoF Funding..................	$248,745	$ -0-	$ 248,745
Capitalized Investment............	-0-	9,007,136	9,007,136
Total..............................	$248,745	$9,007,136	$9,255,881

SUMMARY PURPOSE AND SCOPE:

This project is necessary to improve the reliability of the Central Heating and Cooling Plant (CHCP), Building 24, by upgrading the electrical power distribution and control system and replacement of boiler 2. The electrical work consists of replacement of 26-year-old electrical power distribution and control equipment.

PROJECT JUSTIFICATION:

This project is required to assure the reliable operation of the Johnson Space Center (JSC) heating and cooling systems which provide chilled water, steam, and compressed air to 33 major buildings. The CHCP electrical distribution system's capacity is inadequate for existing loads and operations. Existing conditions and anticipated requirements make it imperative that the electrical distribution system be upgraded. The motor control centers (MCC's) and associated 480-volt switchgear are obsolete and replacement parts are difficult or impossible to obtain. The decreasing reliability of the electrical system jeopardizes the operation of approximately 50 motors and numerous other electrically operated devices which directly affect the supply of chilled water, steam and compressed air to the Center's major buildings. Four reliable boilers are required to supply Center steam requirements. Currently, boiler #2 has deteriorated to the point where it is nonfunctional and beyond economical repair and is out of service. A replacement boiler is required to provide operating diversity, capacity, and performance.

IMPACT OF DELAY:

If this project is not approved, the continuing deterioration of equipment will result in partial or complete failure of the plant's capability to supply the Center's requirements for chilled water, steam and compressed air. A complete failure of systems would force the shutdown of 33 buildings at JSC and impact the work activities of approximately 5,000 personnel.

PROJECT DESCRIPTION:

This project will replace two existing 12.47-kilovolts (kV)/480-volt dry-type interior transformers with two oil-filled transformers, each rated 2.000-kilovoltamps (kVA). The new transformers will be installed on concrete pads adjacent to Building 24. The transformers will be connected to new interior MCC's by new 3,000-ampere bus ducts. The existing gas and water lines will be relocated to facilitate the installation of the transformer pads and the bus ducts. The existing 1,600-ampere MCC-1 will be replaced with a 2.000-ampere unit; the existing 400-ampere MCC-2 will be replaced with a 800-ampere unit; and the existing 2,500-ampere MCC-3 replaced with a 3,000-ampere unit. The new MCC's will be equipped with main tie breakers. The existing boiler 2 will be replaced with a new water tube boiler with a capacity of 65,000 pounds per hour at 400 pounds per square inch and 600 degrees Fahrenheit. The new boiler will be fired with natural gas as the primary fuel and will use No. 2 fuel oil as backup.

PROJECT COST ESTIMATE:

The cost estimate is based on the preliminary engineering report.

	Unit of Measure	Quantity	Unit cost	cost
Land Acquisition	---	---	---	---
Construction	---	---		$2,800,000
Relocate Natural Gas Lines and Water Main	LS	---	---	60,000
Transformers T-1 and T-2, 15-kVA Feeders, and 480-Volt Bus Duct Secondary	LS	---	---	515,000
Replace Motor Control Center Switchgear and Motor Control Center	LS	---	---	955,000
Replace Water Tube Boiler No. 24-2	EA	---	---	1,270,000
Equipment	---	---	---	---
Fallout Shelter (not feasible)	---	---	---	---
Total				$2,800,000

LIST OF RELATED GRAPHICS:

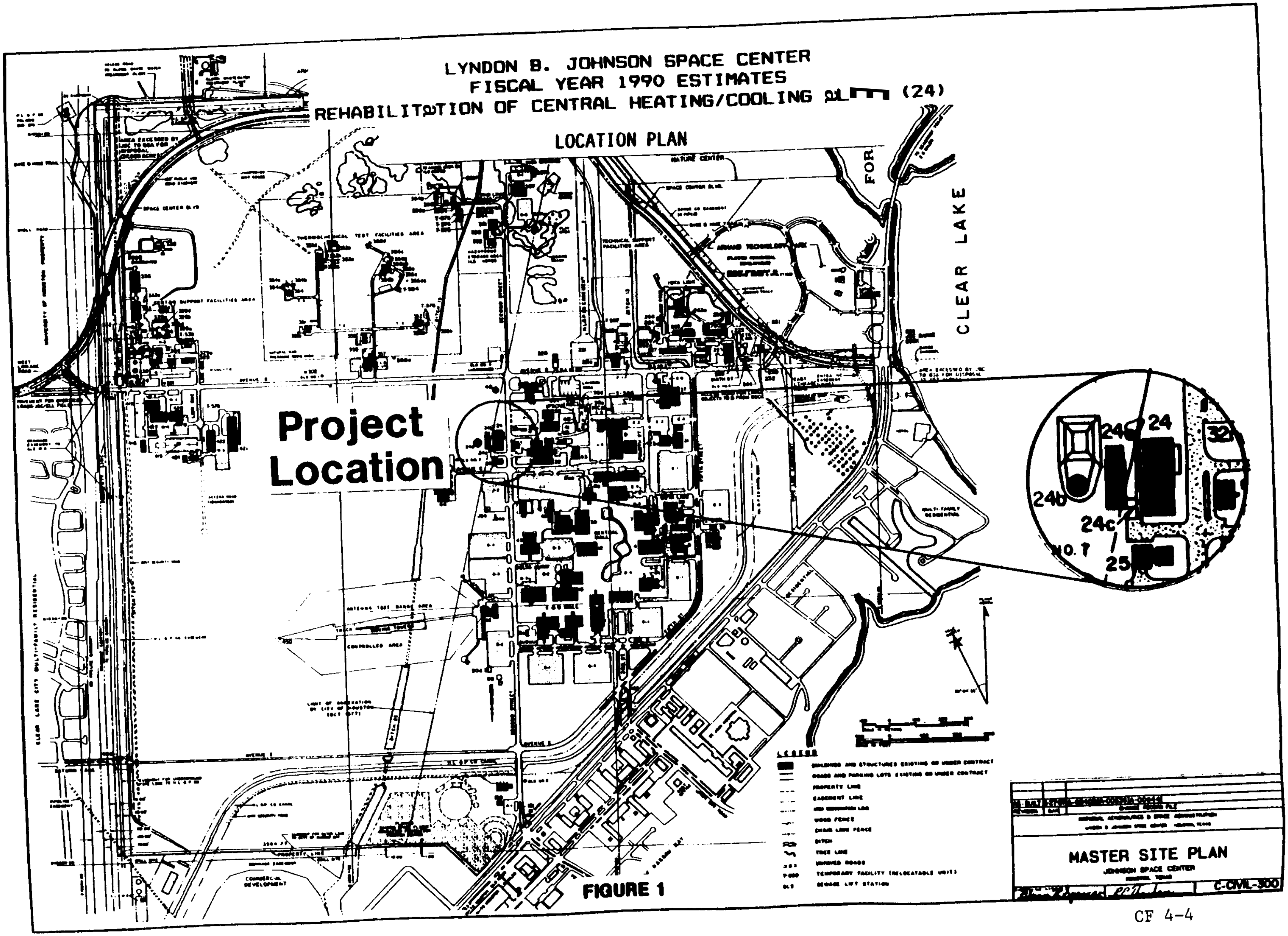
Figure 1 - Location Plan
Figure 2 - First and Second Floor Equipment Layout

OTHER EQUIPMENT SUMMARY:

None.

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

No future CoF funding is anticipated for this project at this time.


LYNDON B. JOHNSON SPACE CENTER
FISCAL YEAR 1990 ESTIMATES
REHABILITATION OF CENTRAL HEATING/COOLING (24)
LOCATION PLAN
Project Location
CLEAR LAKE
NATURE CENTER
24
24a
24b
24c
25
32
NO. 7
MASTER SITE PLAN
JOHNSON SPACE CENTER
C-CIVIL-300
FIGURE 1

LYNDON B. JOHNSON SPACE CENTER
FISCAL YEAR 1990 ESTIMATES
REHABILITATION OF CENTRAL HEATING/COOLING PLANT (24)

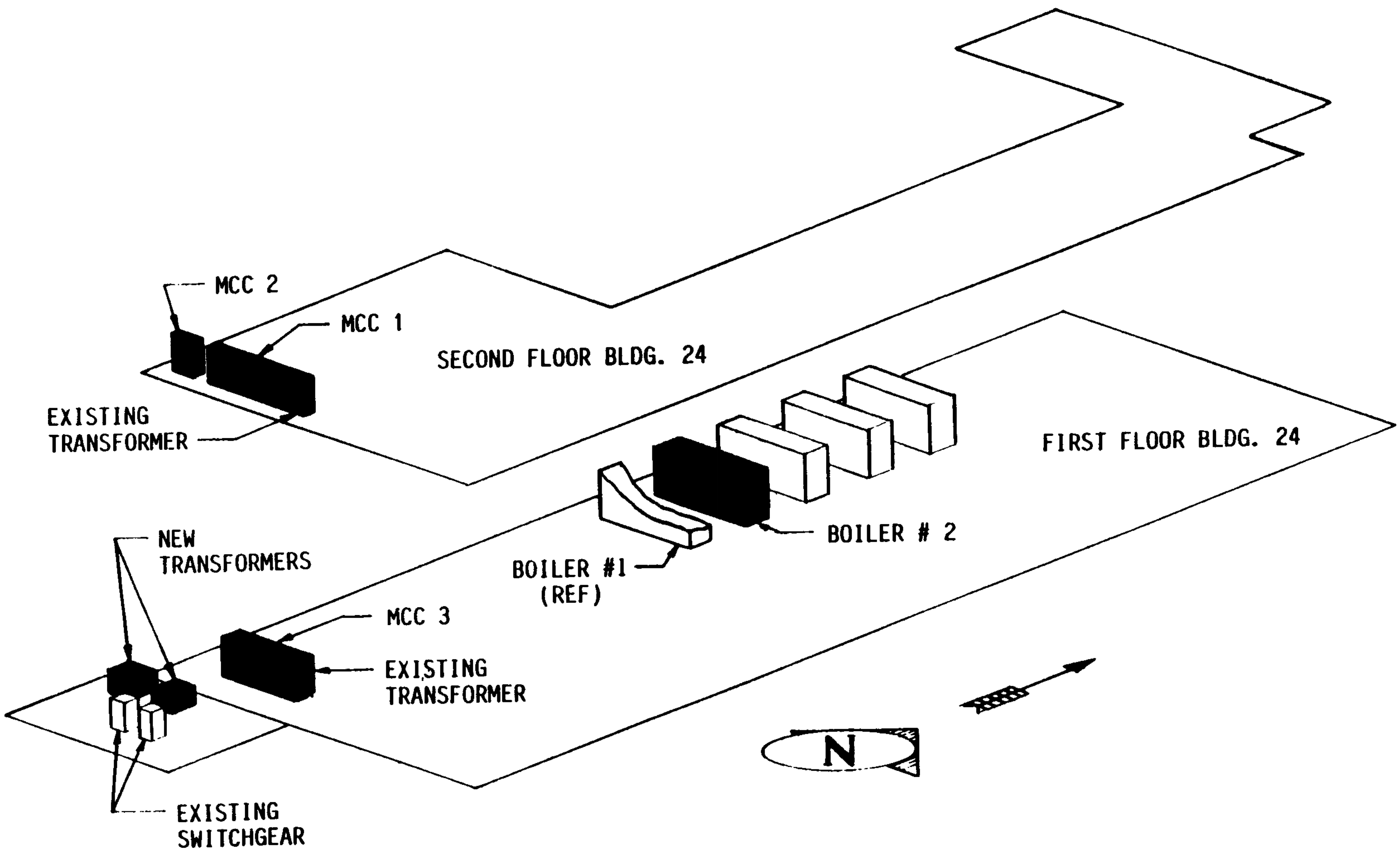


FIGURE 2

GODDARD
SPACE FLIGHT CENTER

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1990 ESTIMATES

SUMMARY

GODDARD SPACE FLIGHT CENTER

	Amount	Page No.
Office of Space Operations:		
Construction of Data Operations Facility	12,000,000	CF 5-1
Office of Space Science and Applications:		
Construction of Quality Assurance and Detector Development Laboratory	7,500,000	CF 5-6
Total	19,500,000	

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1990 ESTIMATES

PROJECT TITLE: Construction of Data Operations Facility

INSTALLATION: Goddard Space Flight Center

FY 1990 CoF Estimate: $12,000,000

LOCATION OF PROJECT: Greenbelt, Prince George's County, Maryland

COGNIZANT HEADQUARTERS OFFICE: Office of Space Operations

FY 1989 AND PRIOR YEARS' FUNDING: The following prior years' funding is related to this project:

	Planning and Design	Construction	Total
Specific CoF Funding......................	$990,000	$6,478,234	$7,468,234
Capitalized Investment....................	---	---	---
Total....................................	$990,000	$6,478,234	$7,468,234

SUMMARY PURPOSE AND SCOPE:

This project provides for the construction of a two-story addition to the Technical Processing Facility, Building 28, to accommodate various data operations systems. These systems will provide for mission data handling and processing, operations management, and communications for the Space Station, Polar Platforms and other missions that require high data communication rates. The dramatic growth in the total volume of science data and other information that must be collected and processed requires the development and integration of advanced data processing and communications equipment and systems supported by this facility.

PROJECT JUSTIFICATION:

The Data Operations Facility (DOF) is required to provide space for the development, integration and operation of data operations systems. To support the dramatic growth of information and related communications activities planned for the Space Station, Polar Platforms, science activities and other high data rate missions, advanced institutional data and operations management systems are required. Various data systems are being developed to provide these capabilities. These mission management services include monitoring, planning, operations management, engineering data processing, data handling, and data distribution for space-to-ground and ground-to-ground communications. Software systems development and management, data processing equipment integration, and complete system testing will be supported in this facility.

Completion of the facility is required by early 1992 to accommodate the delivery and installation of the electronic systems for software development, systems integration and checkout. This work must be completed in in time to allow operational systems checkout prior to the start of Space Station pre-launch activities.

IMPACT OF DELAY:

Delay of this project would impact the development and integration of data and communications systems and jeopardize their availability for Space Station and Polar Platform pre-launch simulation activities.

PROJECT DESCRIPTION:

Project provides for the construction of a 75,300 square foot addition to the Technical Processing Facility, Building 28. Site development includes building access paving, and expansion of the north parking lot with an additional 140 parking spaces and modifications to the storm drainage and utility systems. The addition will be a two-story steel frame structure with carpeted raised access flooring throughout the addition. The Building 28 complex utility systems, including chilled, domestic, and fire protection water, steam lines, and sanitary sewers will be modified to accommodate the new addition. Comfort system space conditioning will be provided by a variable volume, constant temperature and humidity air system. Special air conditioning units supplying underfloor cooling air will supplement the comfort system in areas with high cooling loads.

A double-ended substation will be installed in the basement. Telephone systems, cable ways and conduits will be included in the facility.

PROJECT COST ESTIMATE:

The cost estimate is based on a completed Preliminary Engineering Report.

	Unit of Measure	Quantity	Unit cost	cost
Land Acquisition	---	---	---	---
Construction	---	---	---	$12,000,000
Site Development	LS	---	---	1,000,000
Architectural/Structural	SF	75,300	$92.96	7,000,000
Mechanical	SF	75,300	30.54	2,300,000
Electrical	SF	75,300	22.58	1,700,000
Equipment	---	---	---	---
Fallout Shelter (not feasible)	---	---	---	---
Total				$12,000,000

LIST OF RELATED GRAPHICS:

Figure 1 - Location Plan
Figure 2 - Perspective

OTHER EQUIPMENT SUMMARY:

Computers and other electronic equipment are planned to be provided by Space Flight Control and Data Communications (SFCDC) resources of $320,000,000 and Research and Development (R&D) resources of $50,000,000.

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

No additional CoF funds are required to complete this project.

GODDARD SPACE FLIGHT CENTER
FISCAL YEAR 1990 ESTIMATES
CONSTRUCTION OF DATA OPERATIONS FACILITY

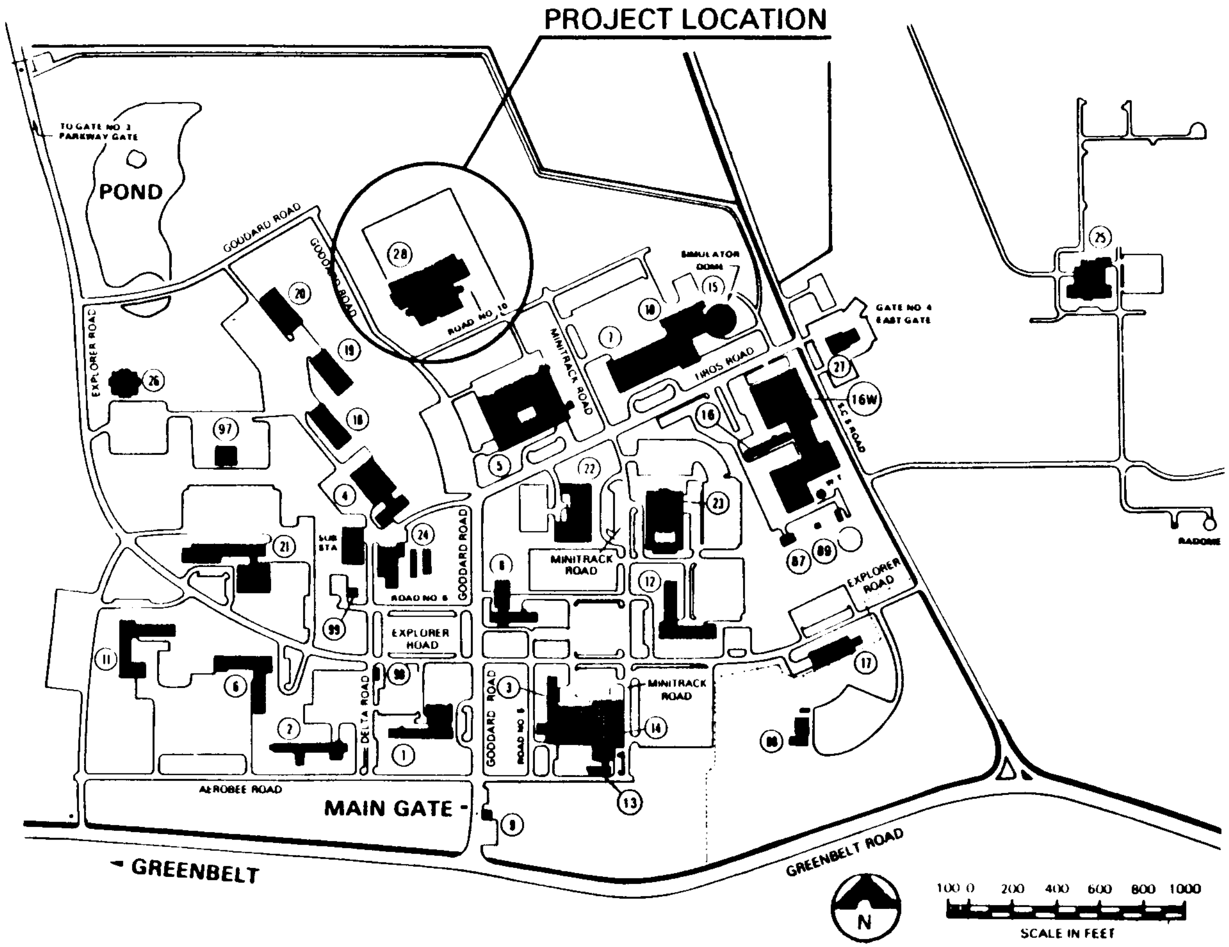


FIGURE 1

GODDARD SPACE FLIGHT CENTER
FISCAL YEAR 1990 ESTIMATES
CONSTRUCTION OF DATA OPERATIONS FACITLITY

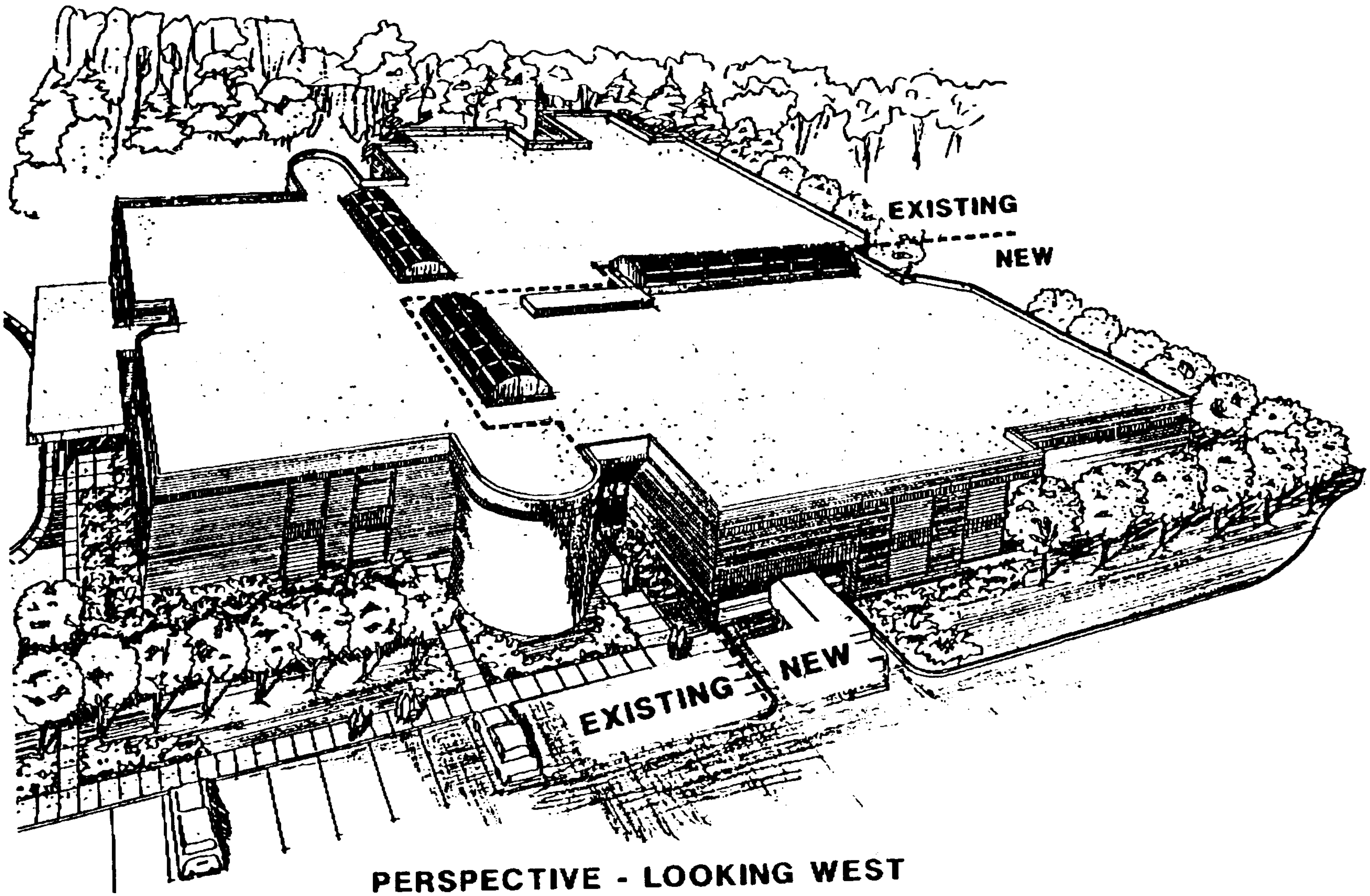


FIGURE 2

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1990 ESTIMATES

PROJECT TITLE: Construction of Quality Assurance and Detector Development Laboratory

INSTALLATION: Goddard Space Flight Center

FY 1990 CoF Estimate: $7,500,000

LOCATION OF PROJECT: Greenbelt, Prince George's County, Maryland

COGNIZANT HEADQUARTERS OFFICE: Office of Space Science and Applications

FY 1989 AND PRIOR YEARS' FUNDING: The following prior years' funding is related to this project:

	Planning and Design	Construction	Total
Specific CoF Funding	$660,000	---	$ 660,000
Capitalized Investment	---	$3,629,479	$3,629,479
Total................	$660,000	$3,629,479	$4,289,479

SUMMARY PURPOSE AND SCOPE:

This project provides for the construction of a two-level, 61,200 square feet technical laboratory to house the Material Quality Assurance Laboratory (MQAL) and the Detector Development Laboratory (DDL) hazardous operations. The missions of the MQAL and the DDL have required increased use of hazardous materials and processes to the extent that it has become critical to move both activities to a separate laboratory specifically constructed to accommodate hazardous functions. This project will provide a suitable facility in a safe area for these operations.

PROJECT JUSTIFICATION:

The Goddard Space Flight Center (GSFC) is responsible for the development and management of unmanned science and applications earth orbiting satellites, Shuttle attached payloads and Space Station modules and platforms. These mission responsibilities include flight materials selection, control, verification and other materials quality assurance related activities; and the design, development and fabrication of advance semiconductor microelectronic detectors to support specific mission requirements. These two activities are supported by the Materials Quality Assurance Laboratory (MQAL) and the Detector Development Laboratory (DDL). These laboratories are collocated with offices and other non-hazardous functions in the Applied Sciences Laboratory, Building 11 and the Space and Terrestrial Applications Facility, Building 22. Despite strict adherence to safety procedures it is now critical for continued safe operations to move these functions to a separate facility.

Performing the MQAL functions involves over 5,000 chemicals, forty-eight of which are extremely hazardous. The chemicals include toxic and/or hazardous gases such as hydrogen sulfide, chlorine, propane, acetylene, hydrogen, methane and ammonia. The significant risk of an accident involving chemical spills or gas leakage dictates that these functions be moved to an isolated facility to eliminate the hazard to the health and safety of other employees.

Semiconductor fabrication in the DDL requires various hazardous processing steps including the use of poisonous gases, poisonous chemicals and low-level radiation. These facilities are currently housed within the main structure of Building 11 which also houses offices, computer facilities and other nonhazardous laboratory facilities. The new facility would house all of the hazardous processes to eliminate the risk of contamination to other working spaces by laboratory mishaps.

IMPACT OF DELAY:

Delay in construction of this project would continue to subject approximately 750 occupants in both buildings to unnecessary potential health and safety risks associated with laboratory mishaps. In addition, materials assurance support activities and the development of advanced electronics would be severely impacted.

PROJECT DESCRIPTION:

The Quality Assurance and Detector Development (QUADD) Laboratory will be a 61,200 square foot two-level brick and block addition connected to the south wall of existing Building 11.

The MQAL and DDL will be located on the main operating level. These two areas will be physically separated by a 4-Hour five rated concrete masonry wall. A gowning/support area (1200 square feet) will serve as the "link" between the existing Building 11 and the entrance to the DDL in the new facility. The DDL area, (8,000 square feet) will be vibration-controlled. The floor plan includes a class 100 laminar flow clean room within a class 10,000 clean room. The class 100 clean area supports all the detector development and fabrication activities and equipment. The class 10,000 support area will be used for equipment and parts staging activities requiring less stringent contamination control requirements.

The MQAL area (23,300 square feet) includes 18 offices along the perimeter and 20 laboratories in the core. The supporting lower level (27,300 square feet) will be used to house process support equipment, building utility systems, chemical storage and other miscellaneous support functions.

In addition, stair towers, a truck dock (1,400 square feet), a gas emergency power generator, de-ionized water system, compressed air system and a full complement of industrial processing gases will be provided. Other supporting utilities such as electric power, communications, chilled water, steam, domestic water, gas, storm drain, sanitary sewer, will be extended from existing Center systems to support this facility.

PROJECT COST ESTIMATE:

The cost estimate is based on a preliminary Engineering Report.

	Unit of Measure	Quantity	Unit cost	cost
Land Acquisition	---	---	---	---
Construction....	---	---	---	$7,500,000
Site Development	LS	---	---	389,000
Architectural	SF	61,200	23.07	1,412,000
Structural	SF	61,200	23.05	1,411,000
Mechanical	SF	61,200	48.14	2,946,000
Electrical	SF	61,200	21.92	1,342,000
Equipment	---	---	---	---
Fallout Shelter (not feasible)	---	---	---	---
Total..				$7,500,000

LIST OF RELATED GRAPHICS:

Figure 1 - Project Location
Figure 2 - Site Plan
Figure 3 - Longitudinal Section

OTHER EQUIPMENT SUMMARY:

Laboratory equipment estimated to cost $4,000,000 will be provided from Research and Development resources.

FUTURE CoF ESTIMATED FUNDING REQUESTED TO COMPLETE THIS PROJECT:

No future CoF funding is anticipated for this project at this time.

GODDARD SPACE FLIGHT CENTER
FISCAL YEAR 1990 ESTIMATES
CONSTRUCTION OF QUALITY ASSURANCE AND DETECTOR DEVELOPMENT LABORATORY
LOCATION PLAN

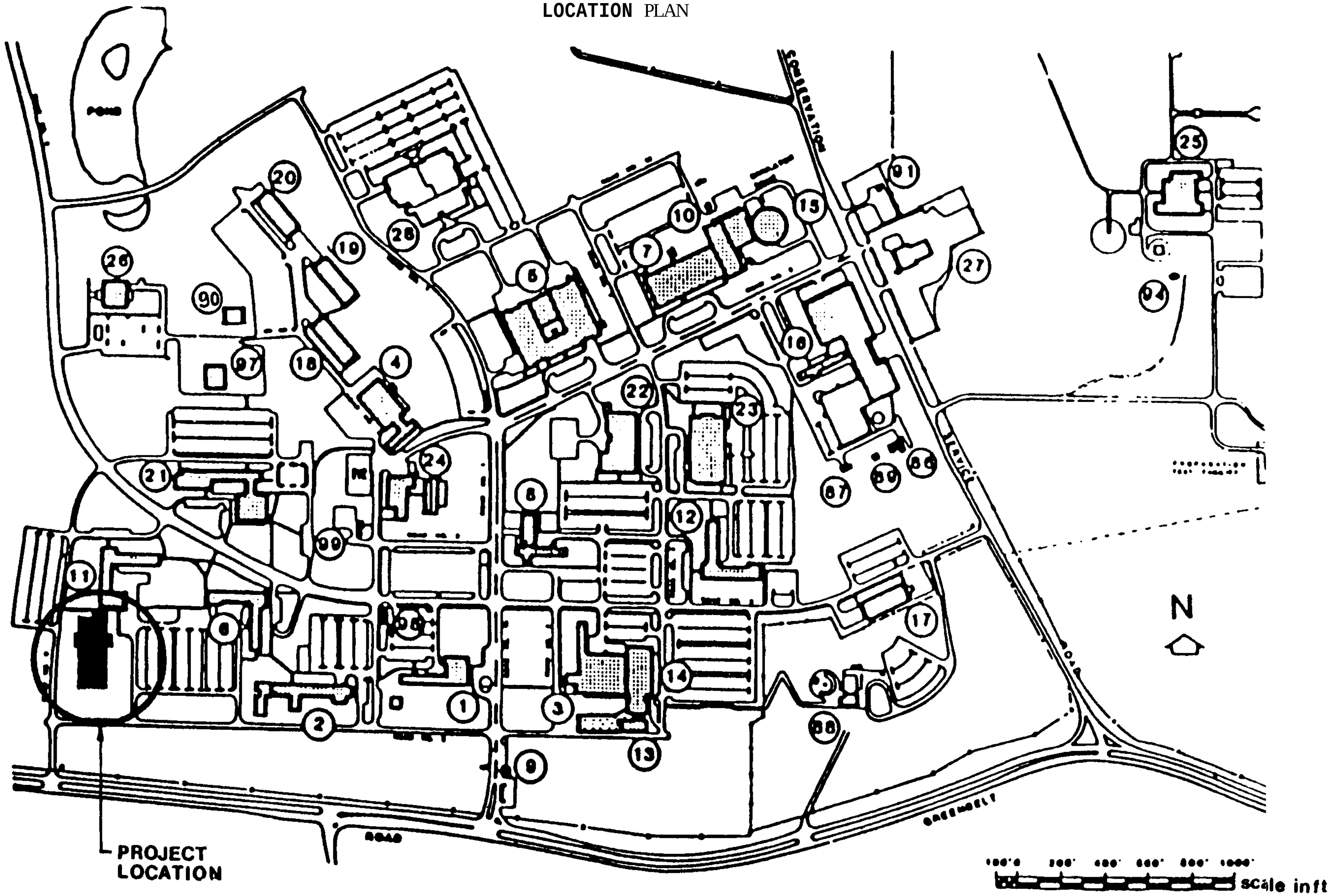


FIGURE 1

GODDARD SPACE FLIGHT CENTER
FISCAL YEAR 1990 ESTIMATES
CONSTRUCTION OF QUALITY ASSURANCE AND DETECTOR DEVELOPMENT LABORATORY
SITE PLAN

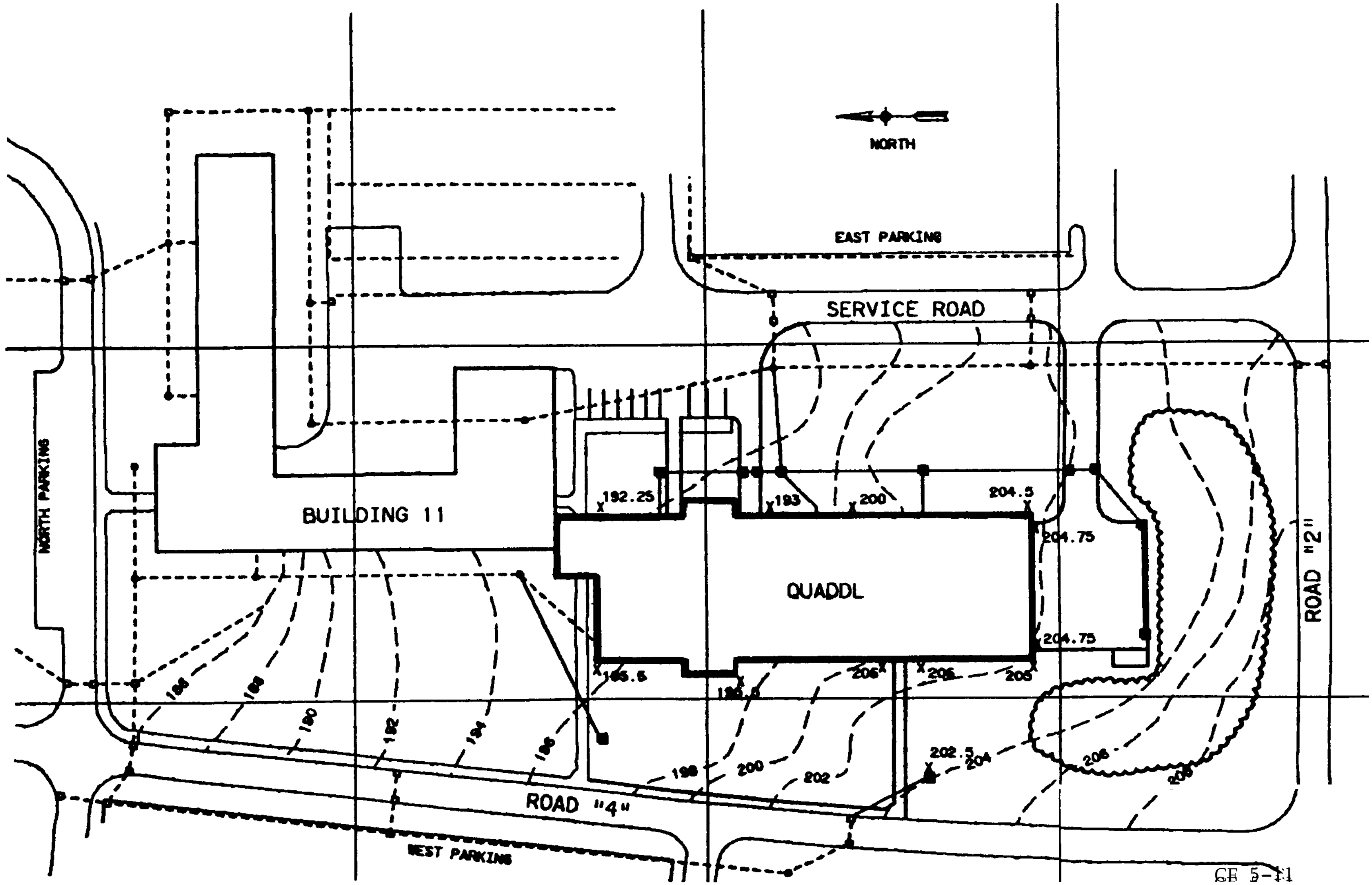


FIGURE 2

GODDARD SPACE FLIGHT CENTER
FISCAL YEAR 1990 ESTIMATES
CONSTRUCTION OF QUALITY ASSURANCE AND DETECTOR DEVELOPMENT LABORATORY
LONGITUDINAL SECTION

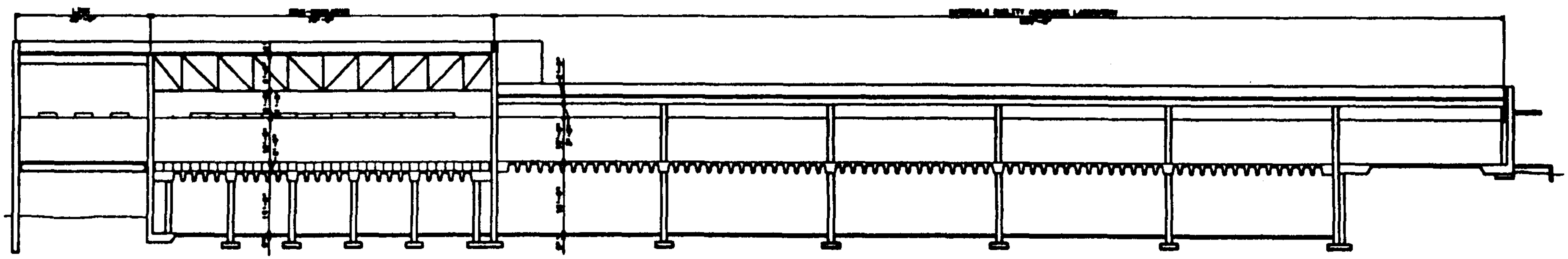


FIGURE 3

JET PROPULSION
LABORATORY

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1990 ESTIMATES

SUMMARY

JET PROPULSION LABORATORY

	Amount	Page No.
Office of Space Science and Applications:		
Modernization of South Utility Systems............................	5,400,000	CF 6-1

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1990 ESTIMATES

PROJECT TITLE: M S

INSTALLATION: J b

LOCATION OF PROJECT: La Canada-Flintridge, Los Angeles County California

COGNIZANT HEADQUARTERS OFFICE: Office of Space Science and Applications

FY 1989 AND PRIOR YEARS' FUNDING: The following prior years' funding is related to this project:

	Planning and Design	Construction	Total
Specific CoF funding....................	$559,000	---	$559,000
Capitalized investment..................	---	---	---
Total................	$559,000	---	$559,000

SUMMARY PURPOSE AND SCOPE:

This project provides for the construction of a 3,500-foot long utility corridor at the southern section of the Laboratory extending from the vicinity of the main gate to near Building 302 via Forestry Camp Road and the lower Arroyo parking lot. Consolidating the required multiple utilities into a single properly located corridor will avoid the continuing massive disruption to the Laboratory's traffic and building access that would be caused by consecutive utility projects digging up the streets and parking areas.

PROJECT JUSTIFICATION:

The Jet Propulsion Laboratory (JPL) Facilities Master Plan provides unified development for the phased installation of supporting utility systems necessary to service new site developments as well as existing facilities. Therefore, this utility corridor is a vital requirement to effectively support the buildings under construction as proposed in the Master Plan.

The JPL utilities services range from "marginally adequate" to "totally inadequate". The Laboratory's sanitary sewer system was installed by the U.S. Army Corps of Engineers in 1956 for a 1,500 person population. Many lines are broken, cracked, displaced or plugged; others are overloaded and totally inadequate for today's 7,500-person population. The present water system is only marginally adequate for fire-fighting. New cooling water distribution lines will eliminate most local cooling towers and circulating and cooling pumps in the area south of Mariner Road and west of the Edison substation. Additional power conduits will permit proper balancing of the load in various areas of the laboratory, and allow for more reliable load management. The communication conduits between the main gate and Surveyor Road, via Mariner Road, are full and additional circuits for new facilities are not possible. Urgent needs are now solved by makeshift installation of new conduits and the system has become a maze of conduits and cables. Storm drains inlets, are also required to properly accept lateral drain elements from new site developments. This project is the first critical step to initiate the functional restoration of JPL's utility system.

IMPACT OF DELAY:

Three major buildings housing 700 people were completed in 1988. The existing utility infrastructure in its present condition, capacity and physical location cannot adequately support these buildings or the nine other buildings planned in the near future.

PROJECT DESCRIPTION:

Included is the following:

- A new sewer collection and removal system consisting of trunk lines and connections serving the southerly and southeastern areas of the Laboratory. Approximately 1,800 feet of 12" vitrified clay pipe (VCP), 125 feet of 10" VCP, 500 feet of 8" VCP, and 50 feet of 6" VCP in addition to 10 manholes and 12 points of connection to existing lines will be installed.

- A new primary lift station using 350 gallons per minute (gpm) vertical pumps and force main installed at and below the West Arroyo Parking Lot and eastward from Building 171.

- 3,100 feet of iron 12" water main from the main gate point of connection around the corridor via the South Gate and over to Surveyor Road, then north to a system connection.

- A new primary 5 pounds per square inch (psi) gas line, composed of 2,000 feet of 8" and 1,200 feet of 6" coated steel pipe, will be installed extending eastward from Oak Grove Drive to Buildings 300 and 302.

- Condenser water supply and return lines, for the future central cooling tower to be built where Buildings 269 and 274 stand, and which will serve all buildings south of Mariner Road and west of the Edison substation, will be installed in the South Corridor. This will include 800 feet of 24" line, 1,400 feet of 16" line, 1,000 feet of 12" line plus 3 dozen valves for further looping and connections.

- Both communications and power conduit and manholes will be installed throughout the South Corridor area and interconnected to the existing net. These total systems will require 18,200 feet of 6" polyvinylchloride (PVC) embedded conduit for power cable, 45,000 feet of 4" PVC communication conduit, 20 power manholes and 25 communications manholes.

- 2,400 feet of 2-1/2" pipe will be laid to support the new air system in the service and fabrication area only.

- Other than surface lateral inlet repairs, no major work to the 24" reinforce clay pipe (RCP) storm drain is anticipated.

PROJECT COST ESTIMATE:

Project cost estimate is based on a preliminary engineering report.

	Unit of Measure	Quantity	Unit cost	cost
Land Acquisition	---	---	---	-0-
Construction	---	---	---	$5,400,000
Sewer Distribution	LS	---	---	1,060,000
Lift Station	LS	---	---	870,000
Water Distribution	LS	---	---	300,000
Gas Distribution	LS	---	---	200,000
Cooling Tower Water Distribution	LS	---	---	610,000
Electrical Distribution	LS	---	---	1,060,000
Communication Distribution	LS	---	---	1,200,000
Compressed Air Distribution	LS	---	---	100.000
Equipment	---	---	---	-0-
Total				$5,400,000

LIST OF RELATED GRAPHICS:

Figure 1 - Location Plan
Figure 2 - Utility Corridor - Typical cross-section

OTHER EQUIPMENT SUMMARY:

There is no other equipment required to complete this project.

FUTURE CoF ESTIMATED FUNDING REQUESTED TO COMPLETE THIS PROJECT:

No future CoF funding is required to complete this project. However, there are future similar systems that will be required for other major areas of the laboratory.

JET PROPULSION LABORATORY
FISCAL YEAR 1990 ESTIMATES
MODERNIZATION OF SOUTH UTILITY SYSTEMS
LOCATION PLAN

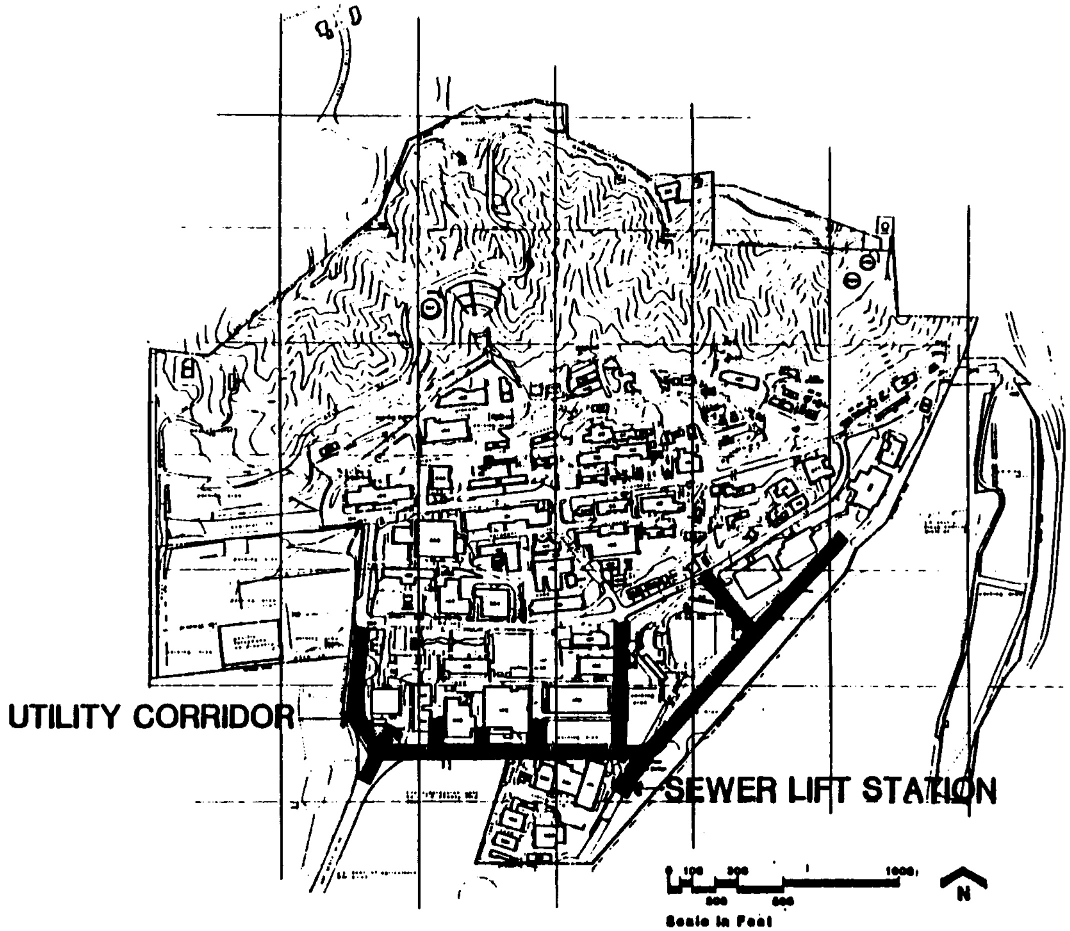
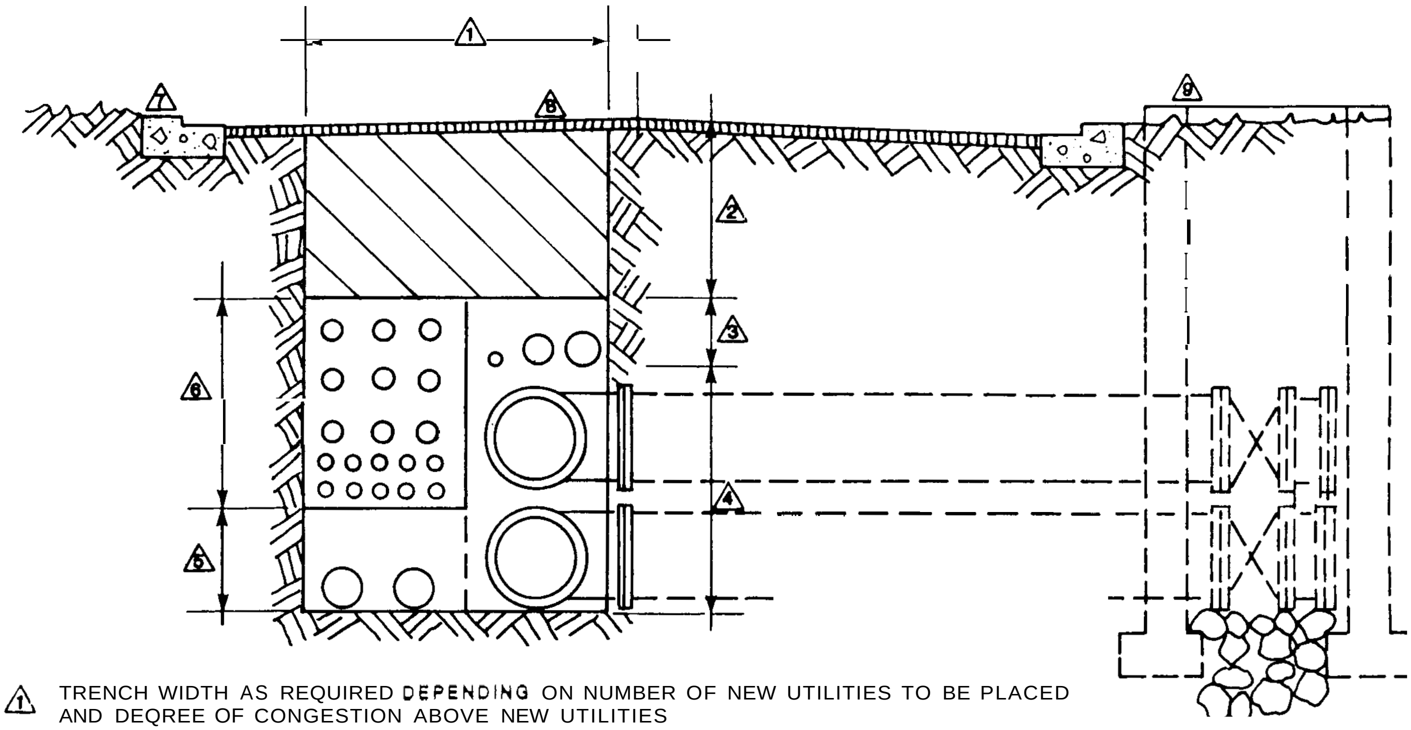


FIGURE 1



1 TRENCH WIDTH AS REQUIRED DEPENDING ON NUMBER OF NEW UTILITIES TO BE PLACED AND DEQREE OF CONGESTION ABOVE NEW UTILITIES

2 ZONE OF EXPECTED CONJESTION AND INTERFERENCE WITH EXISTING UTILITIES. ZONE IS EXPECTED TO VARY FROM 4.0FT TO 6.0FT

3 ZONE OF PLACEMENT OF NEW UTILITIES INCLUDING THE COMPRESSED AIR, NITROGEN GAS. AND DOMESTIC WATER SYSTEMS.

4 ZONE OF PLACEMENT OF THE COOLING TOWER WATER SYSTEM. BOTH THE SUPPLY AND RETURN LINES ARE SHOWN.

5 ZONE OF REPLACEMENT OF THE SANITARY SEWER SYSTEM. BOTH THE GRAVITY AND FORCE MAIN LINES ARE SHOWN.

6 ZONE OF PLACEMENT OF ELECTRICAL AND COMMUNICATIONS CONDUITS INCLUDING CONCRETE INCASEMENT.

7 EXISTING CONCRETE CURBING

8 EXISTING PAVEMENT /SURFACING TO BE REPLACED

9 TYPICAL CAPPED END AND VALVE DETAIL (REFER TO FIGURE 2-11)

CF 6-6

FIGURE 2

AERONAUTICAL
FACILITIES
REVITALIZATION

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1990 ESTIMATES

SUMMARY

AERONAUTICAL FACILITIES REVITALIZATION

	Amount	Page No.
Office of Aeronautics and Space Technology:		
Construction of 40X80 Drive Motor Roof, Ames Research Center.......	1,000,000	CF 7-1
Modifications to Thermo-Physics Facilities, Ames Research Center...	4,600,000	CF 7-6
Modification to 14X22 Subsonic Wind Tunnel, Langley Research Center.	1,000,000	CF 7-10
Modifications to National Transonic Facility for Productivity, Langley Research Center..	7,600,000	CF 7-15
Modifications to 20-Foot Vertical Spin Tunnel, Langley Research Center..	1,900,000	CF 7-20
Rehabilitation of Central Air Systems, Lewis Research Center.......	2,400,000	CF 7-25
Rehabilitation of Central Refrigeration Equipment, Lewis Research Center..	7,200,000	CF 7-31
Rehabilitation of 8X6 Supersonic and 9X15 Low-Speed Wind Tunnels, Lewis Research Center...	6,800,000	CF 7-36
Rehabilitation of Hypersonic Tunnel, Plum Brook....................	4,100,000	CF 7-41
Repair and Modernization of the 12-Foot Pressure Wind Tunnel, Ames Research Center..................................	27,600,000	CF 7-46
Total...	64,200,000	

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1990 ESTIMATES

PROJECT TITLE: Construction of 40x80-Ft. Wind Tunnel Drive Motor Roof

INSTALLATION: Ames Research Center

FY 1990 CoF Estimate: $1,000,000

LOCATION OF PROJECT: Moffett Field, Santa Clara County, CA

COGNIZANT HEADQUARTERS OFFICE: Office of Aeronautics and Space Technology

FY 1989 AND PRIOR YEARS' FUNDING: The following prior years' funding is related to this project:

	Planning and Design	Construction	Total
Specific CoF Funding........................	$93,130	---	$ 93,130
Capitalized Investment.....................	---	124,744,504	124,744,504
Total.............................	$93,130	124,744,504	$124,837,634

SUMMARY PURPOSE AND SCOPE:

The 40- by 80-Foot Wind Tunnel, a major facility of the National Full-scale Aerodynamics Complex (NFAC), requires a roof section above the fan drive nacelles. This area attracts nesting birds and inhibits water drainage. The combination of pooled water and bird droppings creates a corrosive environment which deteriorates equipment and support structures. This project will provide a structural roof above the fan drive nacelles to eliminate this problem. This project is included in the Wind Tunnel Revitalization plan.

JUSTIFICATION:

Maintenance of the structure in and around the fan drives and fan drive nacelles is very extensive and costly. However, cleaning and painting is not a satisfactory solution because of the restricted accessibility. This project will provide protection and greatly reduce the necessity for repeated maintenance activities by providing protection from weathering and rain water and eliminate the nesting of birds. The project will also help reduce drive motor noise impact to the immediate outside environment.

IMPACT OF DELAY:

If the fan drive and fan nacelles are not enclosed and siding and screens are not installed, extensive deterioration of the recently repaired outer structure will continue. Periodic maintenance can be significantly reduced over future years by completion of this project.

PROJECT DESCRIPTION:

The project provides for: design, fabrication, and installation of a gable roof over the wind tunnel fan drive system matching the existing roof lines, covering an area of approximately 15,400 square feet; and the design, fabrication, and installation of new sheet metal sidings and screens for the sides of the tunnel under the new roof structure to prohibit birds from nesting, minimize weathering, and dampen acoustic noise to the surrounding environment.

PROJECT COST ESTIMATE:

This cost estimate is based on a completed preliminary engineering report.

	Unit of Measure	Quantity	Unit cost	cost
Land Acquisition..................................	---	---	---	---
Construction.....................................	---	---	---	$1,000,000
Architectural/Structural Roof Elements....	LS	---	---	1,000,000
Equipment...	---	---	---	---
Fallout Shelter (not feasible)......................	---	---	---	---
Total.............................				$1,000,000

LIST OF RELATED GRAPHICS:

Figure 1 - Location Plan
Figure 2 - Elevation and Cross Section Views

OTHER EQUIPMENT SUMMARY:

None

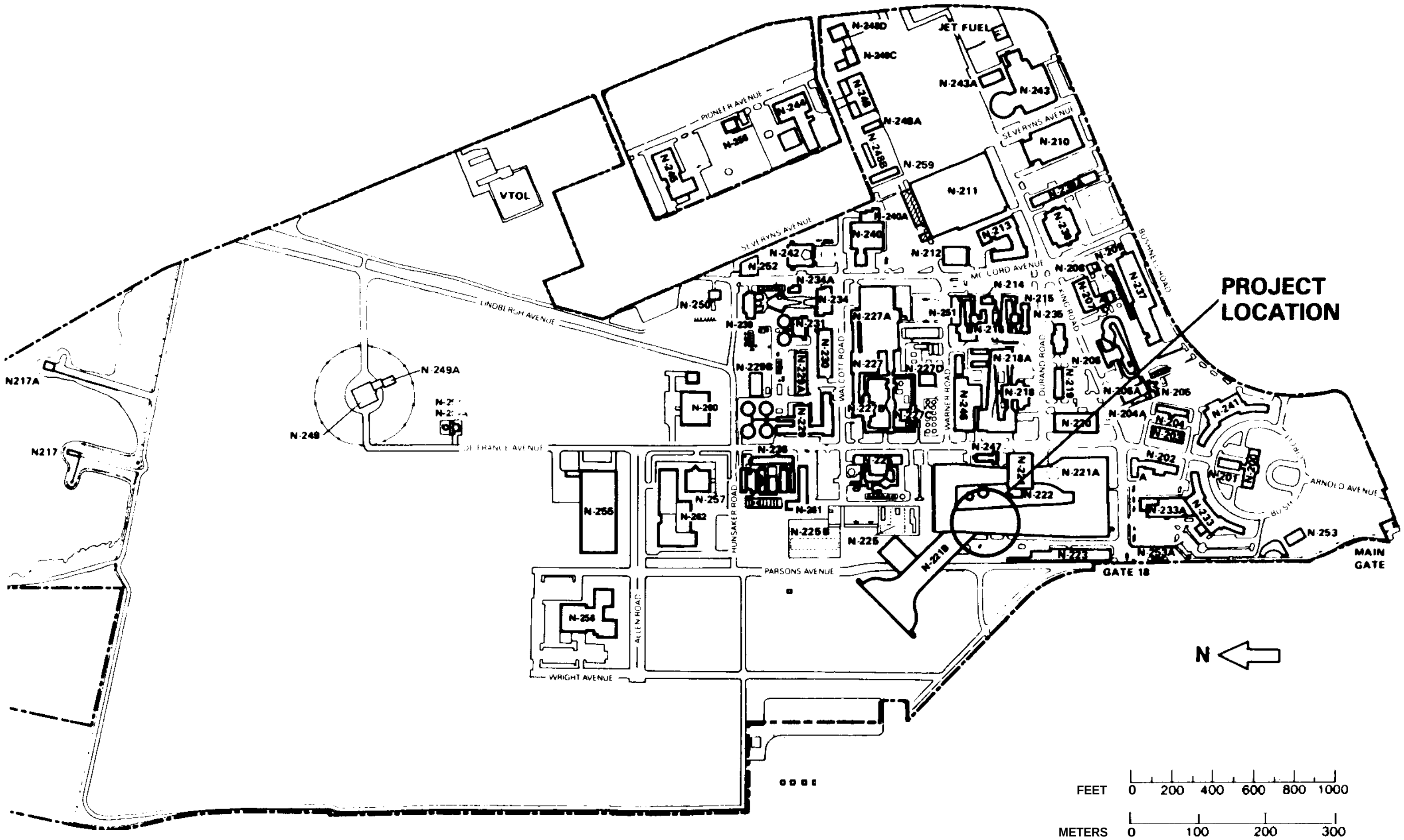
FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

No future CoF Funding is required to complete this project.

NASA-Ames Research Center

FISCAL YEAR 1990 ESTIMATES
CONSTRUCTION OF 40 x 80 FT WT
DRIVE MOTOR ROOF

LOCATION PLAN

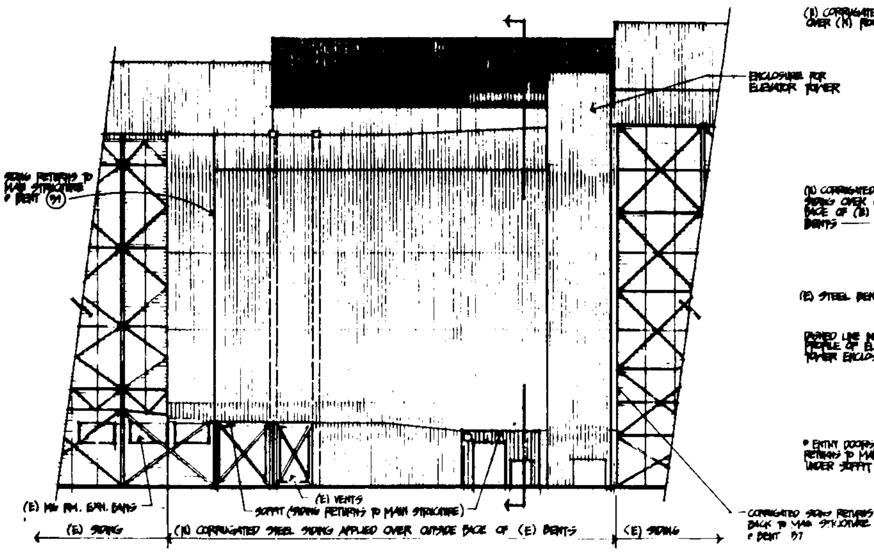


CF 7-4

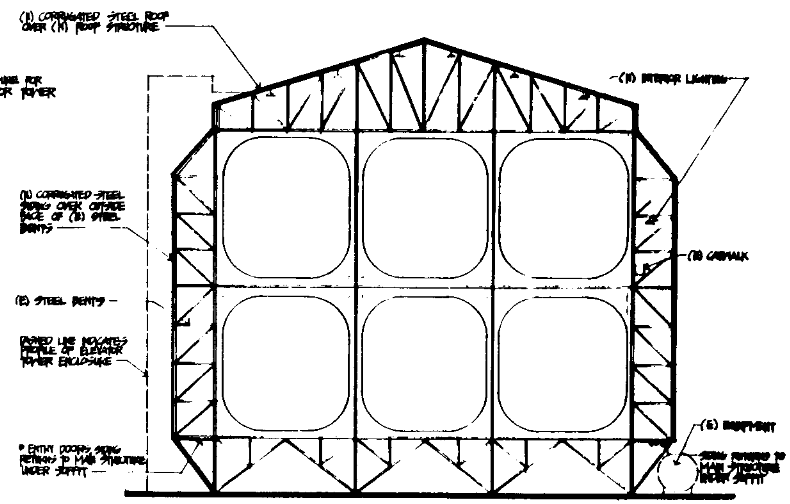
Figure 1

NASA-AMES RESEARCH CENTER
FISCAL YEAR 1990 ESTIMATES
CONSTRUCTION OF 40 × *80* FT. WT
DRIVE MOTOR ROOF

ELEVATION AND CROSS SECTION VIEWS



ELEVATION



SECTION

Figure 2

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1990 ESTIMATES

PROJECT TITLE: Modifications to Thermo-Physics Facilities

INSTALLATION: Ames Research Center

FY 1990 CoF Estimate: $4,600,000

LOCATION OF PROJECT: Moffett Field, Santa Clara County, California

COGNIZANT HEADQUARTERS OFFICE: Office of Aeronautics and Space Technology

FY 1989 AND PRIOR YEARS' FUNDING: The following prior years' funding is related to this project:

	Planning and Design	Construction	Total
Specific CoF funding..................	$434,828	---	$ 434,828
Capitalized investment.......................	---	$27,984,808	27,984,808
Total...............................	$434,828	$27,984,808	$28,419,630

SUMMARY PURPOSE AND SCOPE:

This project modifies and renovates the existing Thermo-Physics facilities (the 3.5-Ft. Hypersonic Wind Tunnel (HWT) and the Arc Jet Tunnels). These facilities must be brought up to modern-day standards and state-of-the-art technology to improve safety, reliability, and performance to support rapidly expanding hypersonic programs. The 3.5-Ft. HWT modifications include replacement of deteriorated heater components, modernization of controls and model supports, and replacement of system components to improve Mach range and Reynolds number capability. Arc Jet Tunnel modifications include replacement of the gas mass flow rate control system and the addition of an automatic control to the power supply control system. This project is an element of NASA's Aeronautical Facilities Revitalization Plan.

PROJECT JUSTIFICATION:

Current research at these test facilities is critical to NASA's role in aerodynamic and thermophysics research. The 3.5-Ft. HWT is one of the Nation's major hypersonic test facilities and plays a key role in providing essential hypersonic data for the National Aero-space Plane (NASP), aeroassisted orbital transfer vehicles, boost-glide vehicles, and fundamental hypersonic aerothermodynamics Research and Technology (R&T) programs. Numerous requests from outside organizations and a significant in-house program related to the NASP indicate that testing in this facility will make significant contributions to advancing the technology needed to make the NASP operational.

Modifications to the Arc Jet Tunnels are required to extend test capabilities, and improve the accuracy and repeatability of test data acquisition. The air and argon mass flow systems, the operator benchboards and central control panels, and the power supply control system must be upgraded to support the above programs and provide a safer and more efficient research facility.

IMPACT OF DELAY:

Continuing to operate the 3.5-Ft. HWT without these modifications will greatly increase the risk of a major failure. The ability to operate at higher Mach and Reynolds numbers will not be available. The Arc Jet Tunnels productivity will continue to decrease due to downtime for troubleshooting and repair. Reduced capacity in either test facility would be a significant loss to our Nation's hypersonic test programs.

PROJECT DESCRIPTION:

Modifications to the 3.5 Ft. Hypersonic Wind Tunnel include replacing the alumina pebble bed heater core with a bed matrix of alumina cored brick, new ceramic brick sidewall insulation to replace damaged bricks, a new structure to replace the existing grate, the 12-inch heater stack valve to be replaced with a new flanged-ball style valve, and two vent valves to be replaced with flanged, ballvalves with pneumatic actuators. Also custom-made heater isolation discharge valve will be extensively modified, and all heater thermocouples, combustion control mass flow meters and stack gas analyzers will be replaced. A new microprocessor controls system will be installed, and the existing model support insertion mechanism will be modified.

Modifications to the Arc Jet Tunnels include installation of new air and argon mass flow control and instrumentation systems. The existing power supply control system will be upgraded to a closed-loop automated system.

PROJECT COST ESTIMATE:

This estimate is based on a completed Preliminary Engineering Report.

	Unit of Measure	Quantity	Unit cost	cost
Land Acquisition	---	---	---	---
Construction	---	---	---	$4,600,000
Heater Cored Brick Matrix	LOT	---	---	304,000
Heater Ceramic Sidewalls	LOT	---	---	774,000
Heater Grate	EA	1	598,000	598,000
Heater Stack/Vent Valve	EA	3	92,000	276,000
Heater Isolation Valve	EA	1	305,000	305,000
Heater Instrumentation	LOT	---	---	940,000
Microprocessor Controller	EA	1	604,000	604.000
Model Support System	EA	1	141,000	141,000
ARC Jet Mass Flow/Power Supply Controls	LOT	---	---	658,000
Power Supply Controls	---	---	---	---
Equipment	---	---	---	---
Fallout Shelter (not feasible)	---	---	---	---
Total				$4,600,000

LIST OF RELATED GRAPHICS:

Figure 1 - Location Plan

OTHER EQUIPMENT SUMMARY:

R&D funds of $320,000 will be provided for special preparation of heater areas.

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

No future CoF funding is required to complete this project.

NASA–Ames Research Center

FISCAL YEAR 1990 ESTIMATES
MODIFICATIONS TO THERMO-PHYSICS FACILITIES

LOCATION PLAN

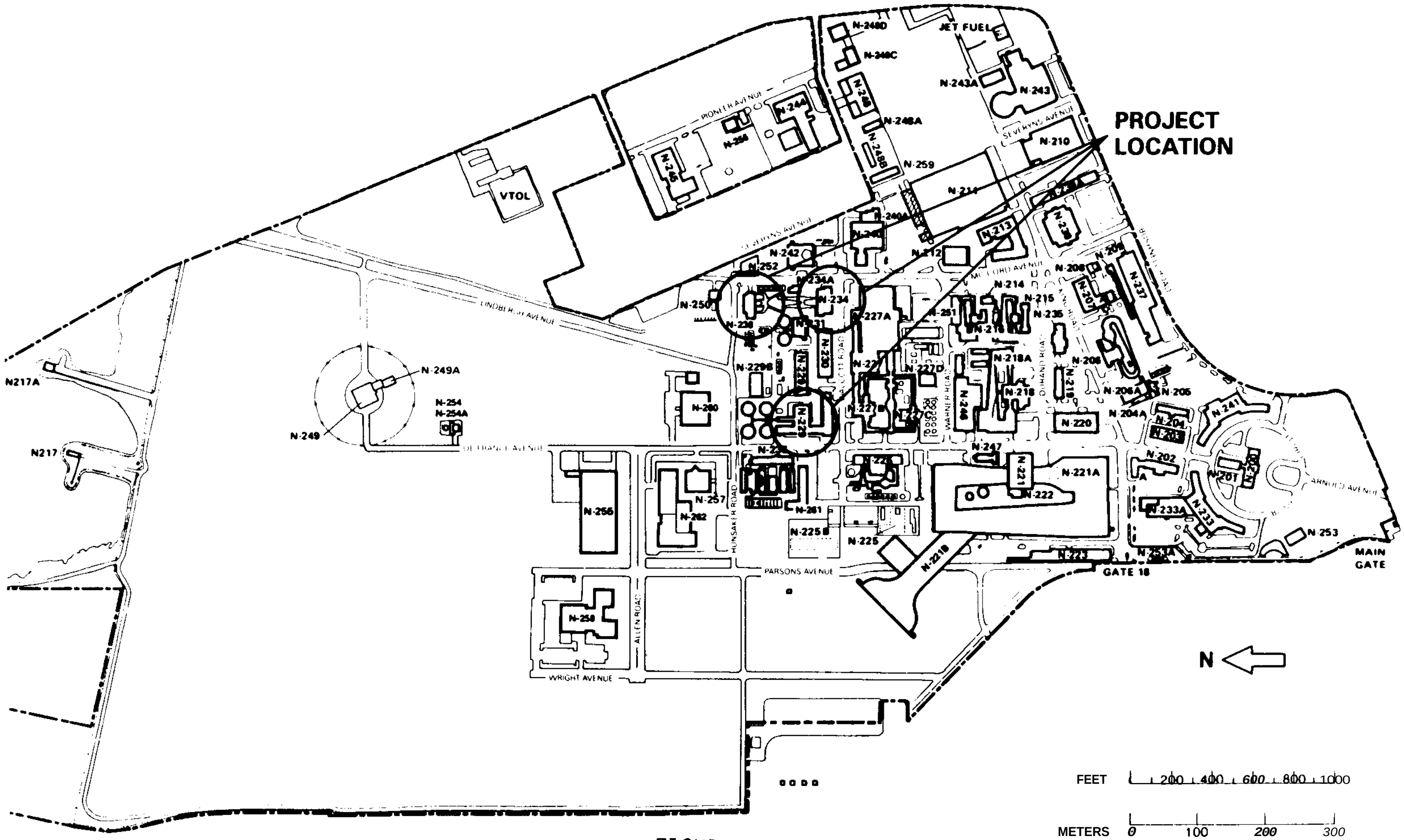


FIGURE 1

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1990 ESTIMATES

PROJECT TITLE: Modifications to 14 X 22 Subsonic Wind Tunnel (1212C)

INSTALLATION: Langley Research Center

FY 1990 CoF Estimate: $1,000,000

LOCATION OF PROJECT: Hampton, Virginia

COGNIZANT HEADQUARTERS OFFICE: Office of Aeronautics and Space Technology

FY 1989 AND PRIOR YEARS' FUNDING: The following prior years' funding is related to this project:

	Planning and Design	Construction	Total
Specific CoF Funding.....................	$95,000	---	$ 95,000
Capitalized Investment........	---	$14,492,035	$14,492,035
Total.................................	$95,000	$14,492,035	$14,587,035

SUMMARY PURPOSE AND SCOPE:

This project will provide improved ground based wind-tunnel simulation of actual flight conditions during landing and high-rate angular motions in maneuvering. Currently, there is a limited capability to investigate rate-of-descent effects and no capability to investigate large amplitude, high-rate angular motions in wind-tunnel facilities. This project will provide a model support system for the 14 X 22 Subsonic Wind Tunnel which will allow the vertical motion speeds and angular pitch rates needed to simulate these parameters. This project is included in of the Wind Tunnel Revitalization plan.

PROJECT JUSTIFICATION:

Recent experimental results obtained in the Langley Vortex Research Facility (VRF) have shown that rate of descent is a very important parameter in analyzing ground effects. Flight data has shown that aircraft undergoing high-rate maneuvers can experience engine compressor stalls due to flow problems associated with the high incidence flow entering the engine inlets. The next generation of fighter aircraft will be required to perform short take-offs and landings. In addition, they must possess extreme maneuver capability. Both parameters are critically important to the development of these aircraft. While rate-of-descent testing is currently possible in the VRF at low free-stream velocities and with a very low productivity rate, there exists no capability for obtaining large amplitude, high-angular-rate information.

In order to obtain experimental wind-tunnel results with rate of descent, large amplitude and high-rate angular motions, a new model support system is needed. This system will have the capability to provide vertical motion for rates-of-descent up to 12 ft/sec and pitching motion for angular rates up to 60 deg/sec. The system will be computer controlled and hydraulically powered to provide a range of vertical speeds and angular rates which can be used either in combination or separately as required by test objectives.

IMPACT OF DELAY:

A delay in this project will require that rate-of-descent testing to continue in a very low-speed facility with low productivity where proper power effects cannot be modeled accurately and will eliminate the possibility of large amplitude, high-rate angular testing for maneuvering aircraft since no capability currently exists.

PROJECT DESCRIPTION:

This project will provide a new computer controlled model support system, powered by a 5000-psi hydraulic system to provide vertical velocities up to 12 ft/sec and pitch angular rates up to 60 deg/sec. Vertical and pitch motions will be commanded separately or in combination as required by the test program. The complete support system consists of a new vertical post assembly and drive mechanism, a new model support cart to provide the required system stiffness and impedence, and provisions for a future 8-Ft X 8-Ft moving-belt ground plane located ahead of the post in the floor of the cart.

PROJECT COST ESTIMATE:

Project cost estimate is based on preliminary engineering report.

	Unit of Measure	Quantity	Unit Cost	cost
Land Acquisition	---	---	---	---
Construction..	---	---	---	$1,000,000
Structural..	LS	---	---	200,000
Mechanical	LS	---	---	700,000
Electrical	LS	---	---	100,000
Equipment	---	---	---	---
Fallout Shelter (not feasible)	---	---	---	---
Total.				$1,000,000

LIST OF RELATED GRAPHICS:

Figure 1 - Location Plan
Figure 2 - Dynamic Model Support System

OTHER EQUIPMENT SUMMARY:

None.

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

At the present time there are no requirements for future CoF funding.

LANGLEY RESEARCH CENTER
FISCAL YEAR 1990 ESTIMATE

MODIFICATIONS TO 14- BY 22-FOOT SUBSONIC WIND TUNNEL (1212C)

LOCATION PLAN

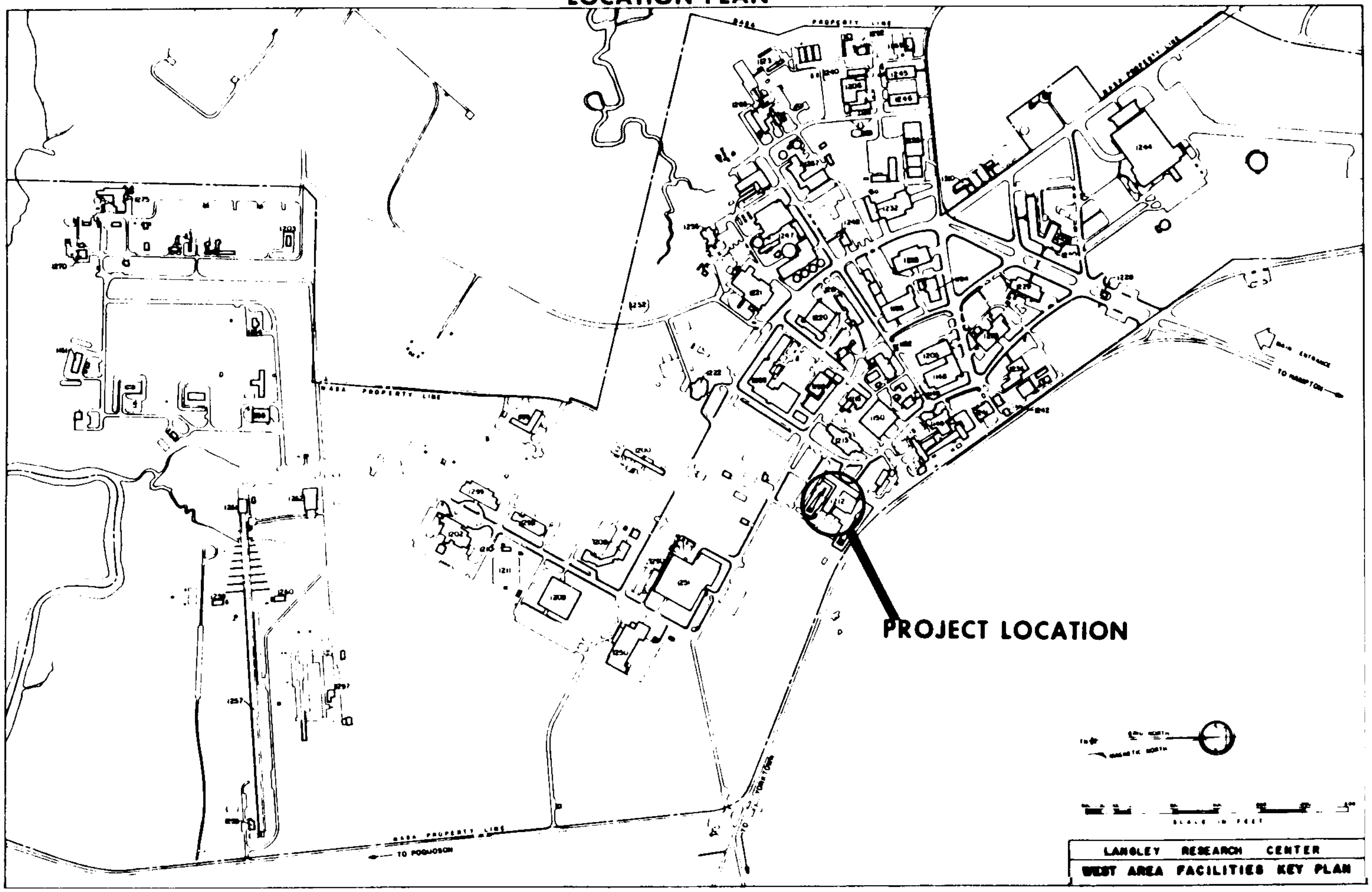


FIGURE 1

LANGLEY RESEARCH CENTER
FISCAL YEAR 1990 ESTIMATE

MODIFICATIONS TO 14- BY 22-FOOT SUBSONIC WIND TUNNEL (1212C)
DYNAMIC MODEL SUPPORT SYSTEM

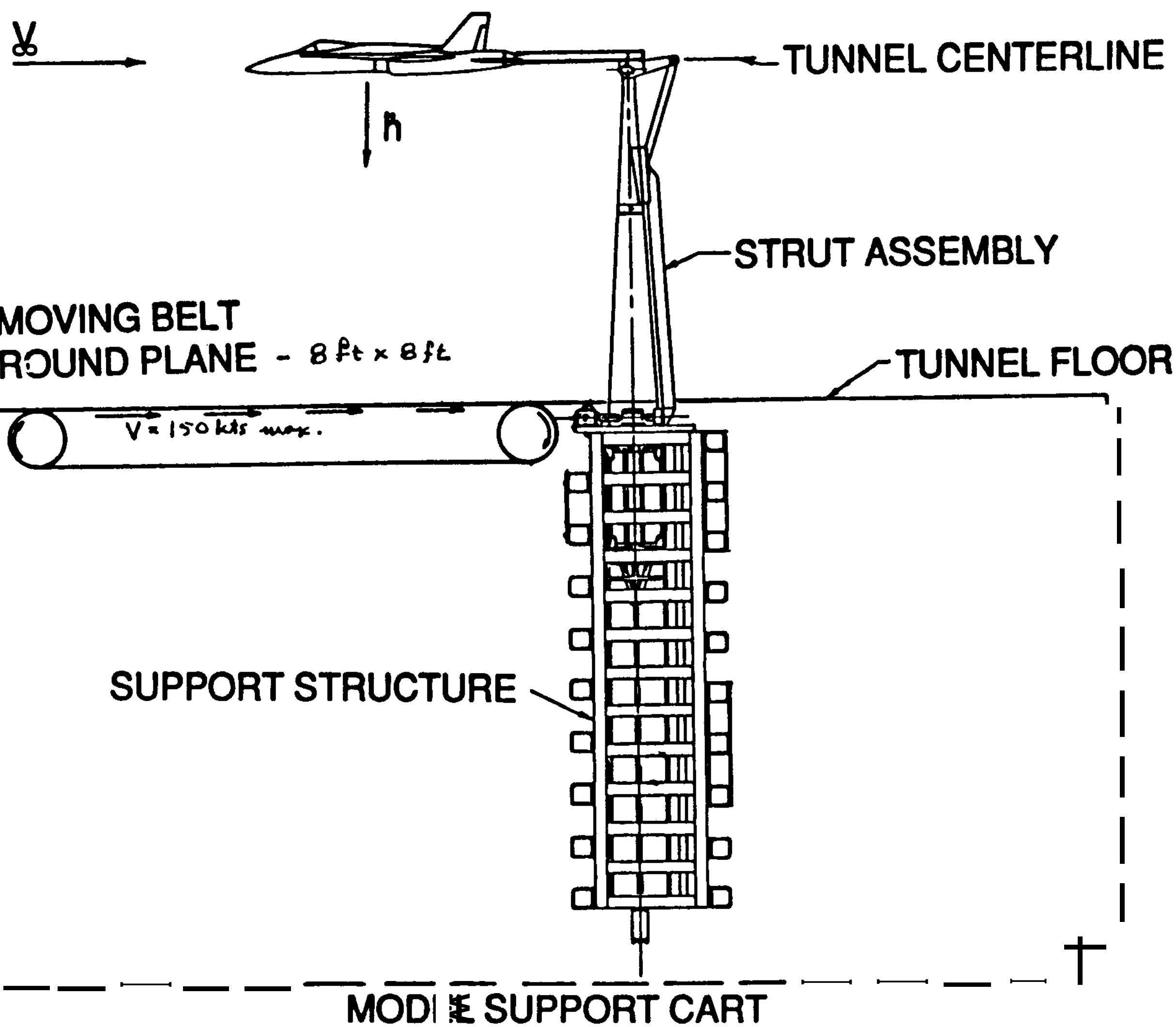


FIGURE 2

CF 7-14

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1990 ESTIMATES

PROJECT TITLE: Modifications to National Transonic Facility for Productivity (1236)

INSTALLATION: Langley Research Center

FY 1990 CoF Estimate: $7,600,000

LOCATION OF PROJECT: Hampton, Virginia

COGNIZANT HEADQUARTERS OFFICE: Office of Aeronautics and Space Technology

FY 1989 AND PRIOR YEARS' FUNDING: The following prior years' funding is related to this project:

	Planning and Design	Construction	Total
Specific CoF Funding......................	$738,000	$ ---	$ 738,000
Capitalized Investment......	$ ---	$113,244,824	$113,244,824
Total....................................	$738,000	$113,244,824	$113,982,824

SUMMARY PURPOSE AND SCOPE:

This project will enhance the present testing capability of the National Transonic Facility (NTF) by providing the required capability for the research and development of the next generation commercial and military aircraft. Development of these aircraft will require additional testing capability for the NTF in the areas of flow quality, testing at large angles of attack, sideslip and productivity. The proposed modifications will meet these needs. This project is included in the Wind Tunnel Revitalization plan.

PROJECT JUSTIFICATION:

The NTF is the nation's premier transonic wind tunnel for simulation of flight Reynolds numbers for aircraft and aerospace vehicles. However, since the design requirements were specified in the early 1970's, advancements in aircraft technology have occurred which make it practical to use extensive laminar flow for subsonic transport aircraft and extreme attitudes for maneuvering fighter aircraft which result in significant performance gains. The NTF provides a unique capability to achieve full scale Reynolds numbers at transonic speeds. The proposed modifications are required in order to effectively apply this high Reynolds number capability to research and development of the next generation transport and fighter aircraft. The recent "assessment of NASA's major wind tunnel facilities with respect to current and future needs" by the Wind Tunnel Study Task Team identified this capability as a critical requirement to meet the research and development test needs in the 1990's.

IMPACT OF DELAY:

Without these modifications the NTF cannot provide the level of productivity and efficiency needed to support the testing requirements planned for the FY 1990's. These modifications will both improve and enhance the tunnel's current capabilities to the state-of-the-art required of a national test facility.

PROJECT DESCRIPTION:

This project includes: a choke at the entrance of the high speed diffuser that will reduce noise levels in the test section and improve flow quality; an automated sting for testing at large angles of attack from 0 to 70 degrees and ± 15 degrees in yaw; a model support system capable of accommodating a normal force of 4,500 pounds at the maximum angle of attack and will change the angle of attack at a rate of 4 degrees per second with a positioning accuracy of 0.1 degree; an enhanced tunnel control system; the addition of a new large liquid nitrogen storage tank; a 3,000 square foot single story structure for model preparation and tunnel support activities; the replacement of an existing transformer with one of increased capacity; and replacement of the existing hydraulic system operating the pitch system with a new pump-accumulator hydraulic source, piping components, and pressure switches.

PROJECT COST ESTIMATE:

Project cost estimate is based on preliminary engineering report.

	Unit of Measure	Quantity	Unit cost	cost
Land Acquisition	---	---	---	---
Construction	---	---	---	$7,600,000
Diffuser Choke	LS	---	---	2,255,000
High-Alpha Sting and Arc Sector Roll System	LS	---	---	395,000
Upgrade Controls	LS	---	---	1,245,000
Liquid Nitrogen Tank	LS	---	---	2,360,000
Shop Space	LS	---	---	682,000
480 Volt Power Supply	LS	---	---	409,000
Pitch System Hydraulics	LS	---	---	254,000
Equipment	---	---	---	---
Fallout Shelter (not feasible)	---	---	---	---
Total				$7,600,000

LIST OF RELATED GRAPHICS:

Figure 1 - Location Plan
Figure 2 - Site Plan

OTHER EQUIPMENT SUMMARY:

None.

FUTURE CoF ESTIMATED FUNDING REQUESTED TO COMPLETE THIS PROJECT:

At the present time there are no requirements for future CoF funding.

LANGLEY RESEARCH CENTER
FISCAL YEAR 1990 ESTIMATE

MODIFICATIONS TO NATIONAL TRANSONIC FACILITY FOR PRODUCTIVITY (1236)

LOCATION PLAN

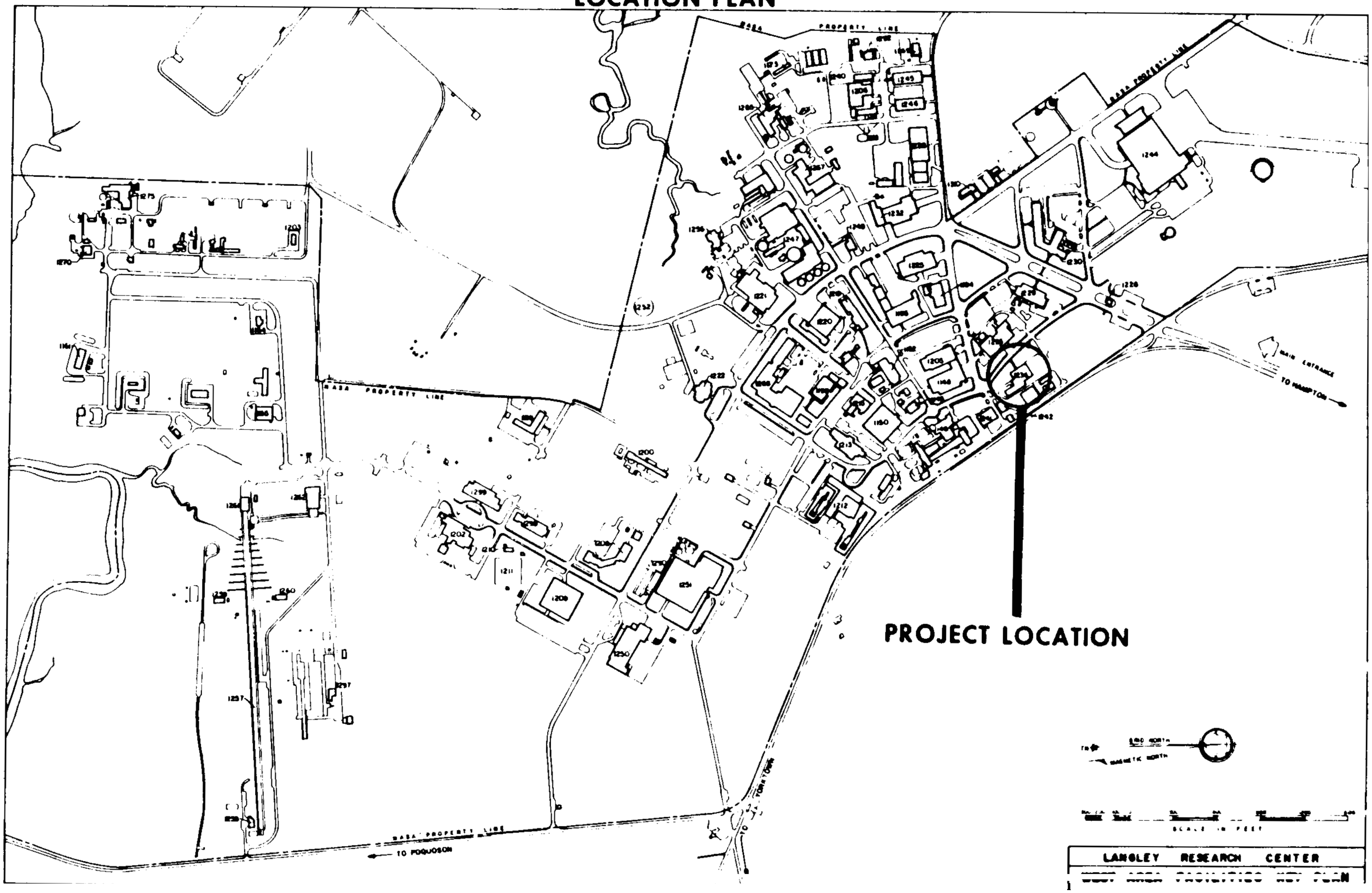


FIGURE 1

LANGLEY RESEARCH CENTER
FISCAL YEAR 1990 ESTIMATE

MODIFICATIONS TO NATIONAL TRANSONIC FACILITY FOR PRODUCTIVITY (1236)
SITE PLAN

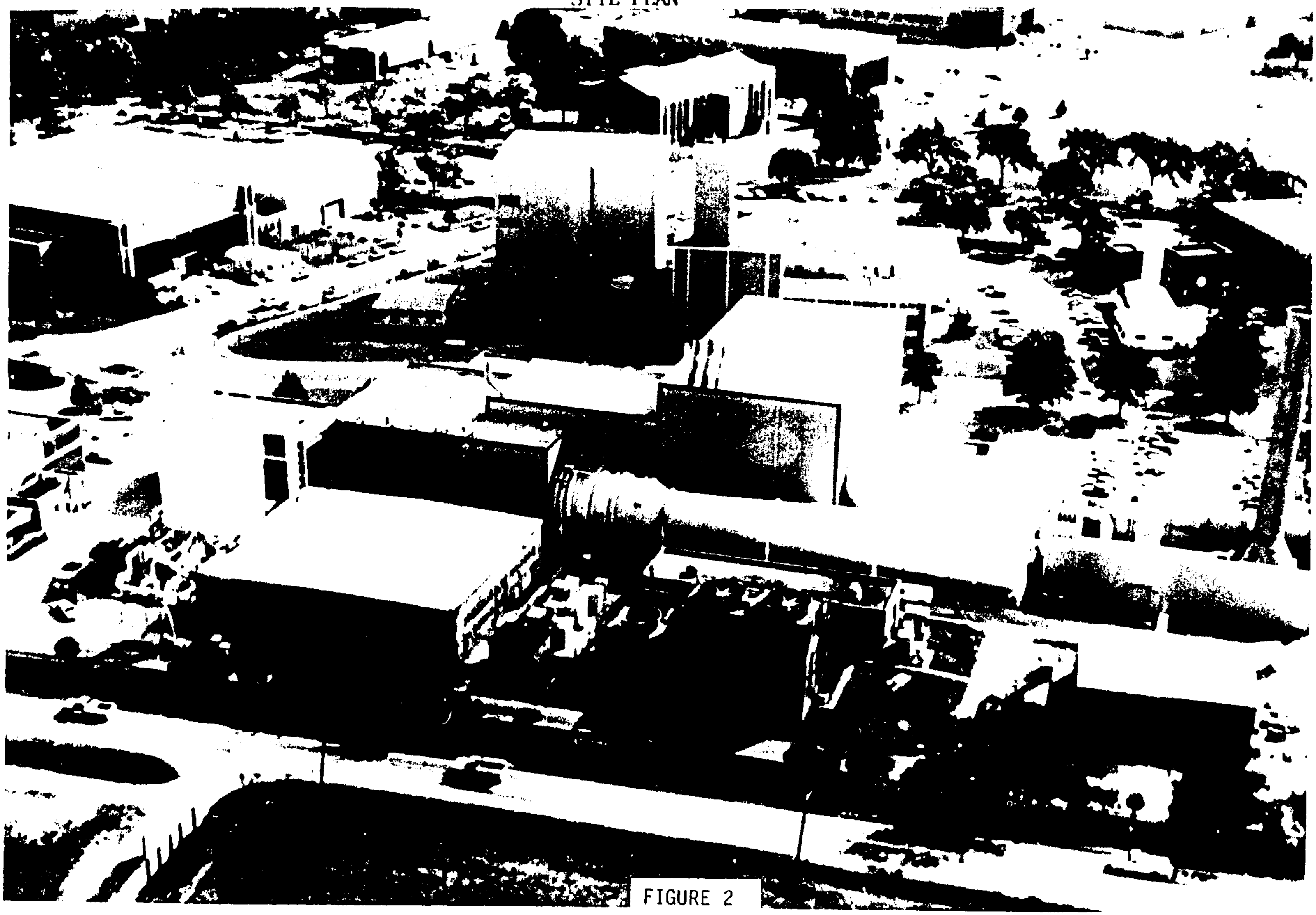


FIGURE 2

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1990 ESTIMATES

PROJECT TITLE: Modifications to 20-Foot Vertical Spin Tunnel (645)

INSTALLATION: Langley Research Center

FY 1990 CoF Estimate: $1,900,000

LOCATION OF PROJECT: Hampton, Virginia

COGNIZANT HEADQUARTERS OFFICE: Office of Aeronautics and Space Technology

FY 1989 AND PRIOR YEARS' FUNDING: The following prior years' funding is related to this project:

	Planning and Design	Construction	Total
Specific CoF Funding......................	$182,000	---	$ 182,000
Capitalized Investment....................	---	$607,511,000	$607,511,000
Total....................................	$182,000	$607,511,000	$607,693,000

SUMMARY PURPOSE AND SCOPE:

This project is required to significantly improve the productivity of the only free-spinning vertical wind tunnel in the Western Hemisphere. This facility has been under continuous heavy demand for over 40 years and existing systems that are severely worn out from age and use must be upgraded. This project is included in the Wind Tunnel Revitalization plan.

PROJECT JUSTIFICATION:

After more than 40 years of essentially continuous operation, the tunnel requires equipment upgrades to improve test productivity and to eliminate maintenance problems stemming from obsolete and worn out systems. All new high-performance aircrafts designs are tested in the tunnel and these upgrades will minimize test delays and slippages.

Control of the tunnel airspeed is crucial to test efficiency. The current control system, consisting of a manual rheostat and relay, generates serious lags in drive motor response and is prone to malfunction. A modern digital control system, when coupled with a vane support and positioning system, will increase reliability, and will significantly reduce the need for re-runs.

The present rotary balance is over 40 years old and is worn beyond reasonable tolerances, as well as being susceptible to breakdowns. It places serious limitations on model weight and adjustment capability. The new rotary balance will permit greater test efficiency at higher data accuracy levels.

The video system upgrades will improve image resolution, documentation editing and provide a remote analysis station. These improvements will increase test efficiency, reporting and analysis.

IMPACT OF DELAY:

The facilities are under heavy demand by airframe contractors for high performance aircraft development and by DOD agencies. Delay in implementing the upgrades will perpetuate an unsatisfactory situation and additional breakdowns and malfunctions of the aging equipment can be expected.

PROJECT DESCRIPTION:

This project will replace the rheostat and relay-based control system with a modern solid-state digital electronics and provide new wiring from the motor to a new control panel including the installation of a new vane support and positioning system; provide high quality read outs of tunnel air speed, motor rpm, and all important status parameters; provide new control console; install a new retractable support arm; and a new high load capacity model positioning system. In addition, a new high-resolution color video camera system with remote positioning will be installed.

PROJECT COST ESTIMATE:

Project cost estimates are based on Preliminary Engineering Report dated July 1988.

	Unit of Measure	Quantity	Unit cost	cost
Land Acquisition	---	---	---	---
Construction	---	---	---	$1,900,000
Tunnel Speed Controls	LS	---	---	1,053,000
Vane Support and Positioning	LS	---	---	175,000
Rotary Balance System	LS	---	---	485,000
Video Camera Recorder (VCR) System	LS	---	---	187,000
Equipment	---	---	---	---
Fallout Shelter (not feasible)	---	---	---	---
Total				$1,900,000

LIST OF RELATED GRAPHICS:

Figure 1 - Location Plan
Figure 2 - Site Plan

OTHER EQUIPMENT SUMMARY:

Installation of a data acquisition system estimated at $500K, is anticipated in FY 1989.

FUTURE CoF ESTIMATED FUNDING REQUESTED FOR COMPLETE THIS PROJECT:

At present time these are no requirements for future CoF funding.

LANGLEY RESEARCH CENTER
FISCAL YEAR 1990 ESTIMATE

MODIFICATIONS TO 20-FOOT VERTICAL SPIN TUNNEL (645)

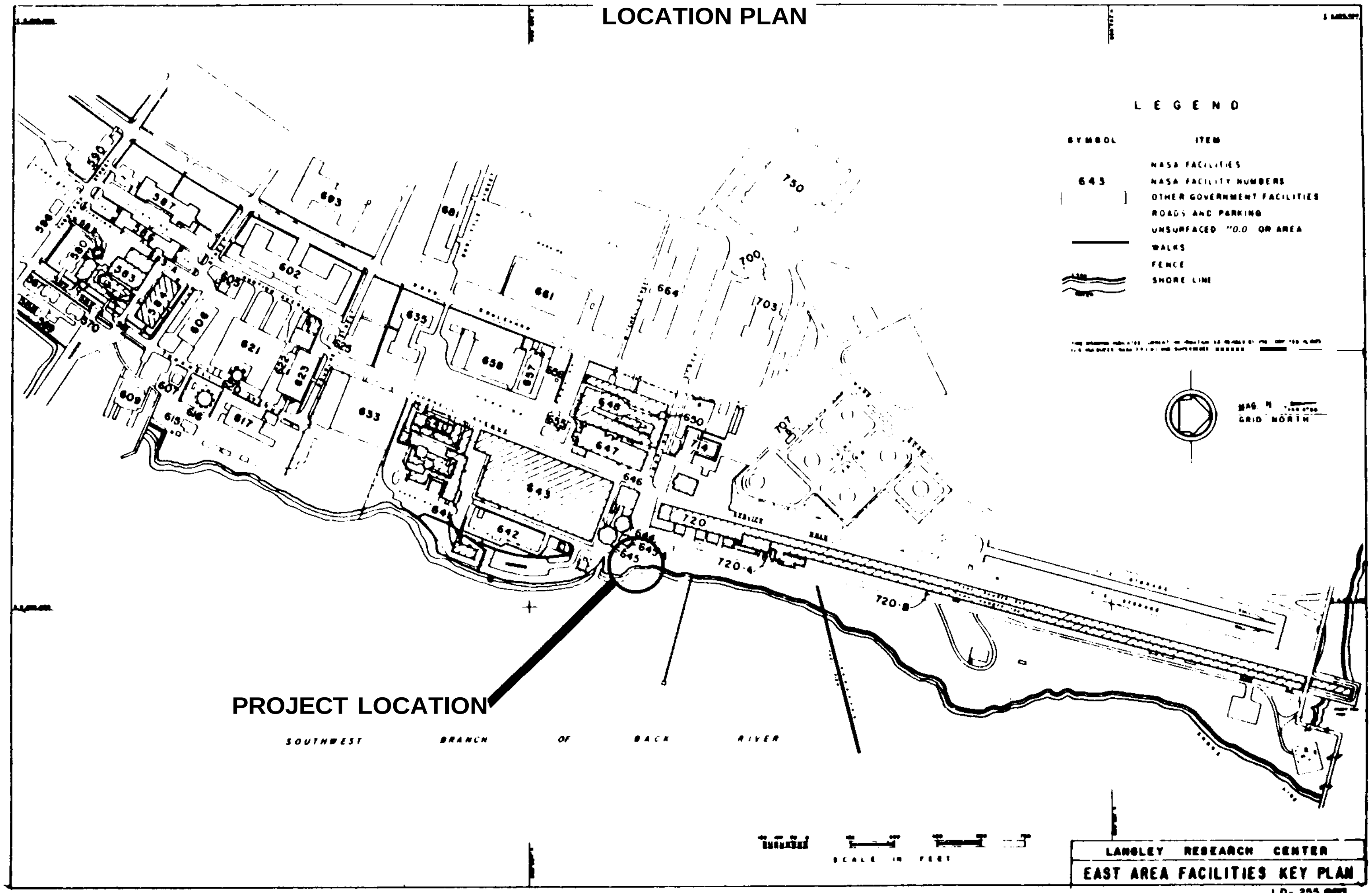


FIGURE 1

LANGLEY RESEARCH CENTER
FISCAL YEAR 1990 ESTIMATE

MODIFICATIONS TO 20-FOOT VERTICAL SPIN TUNNEL (645)
SITE PLAN

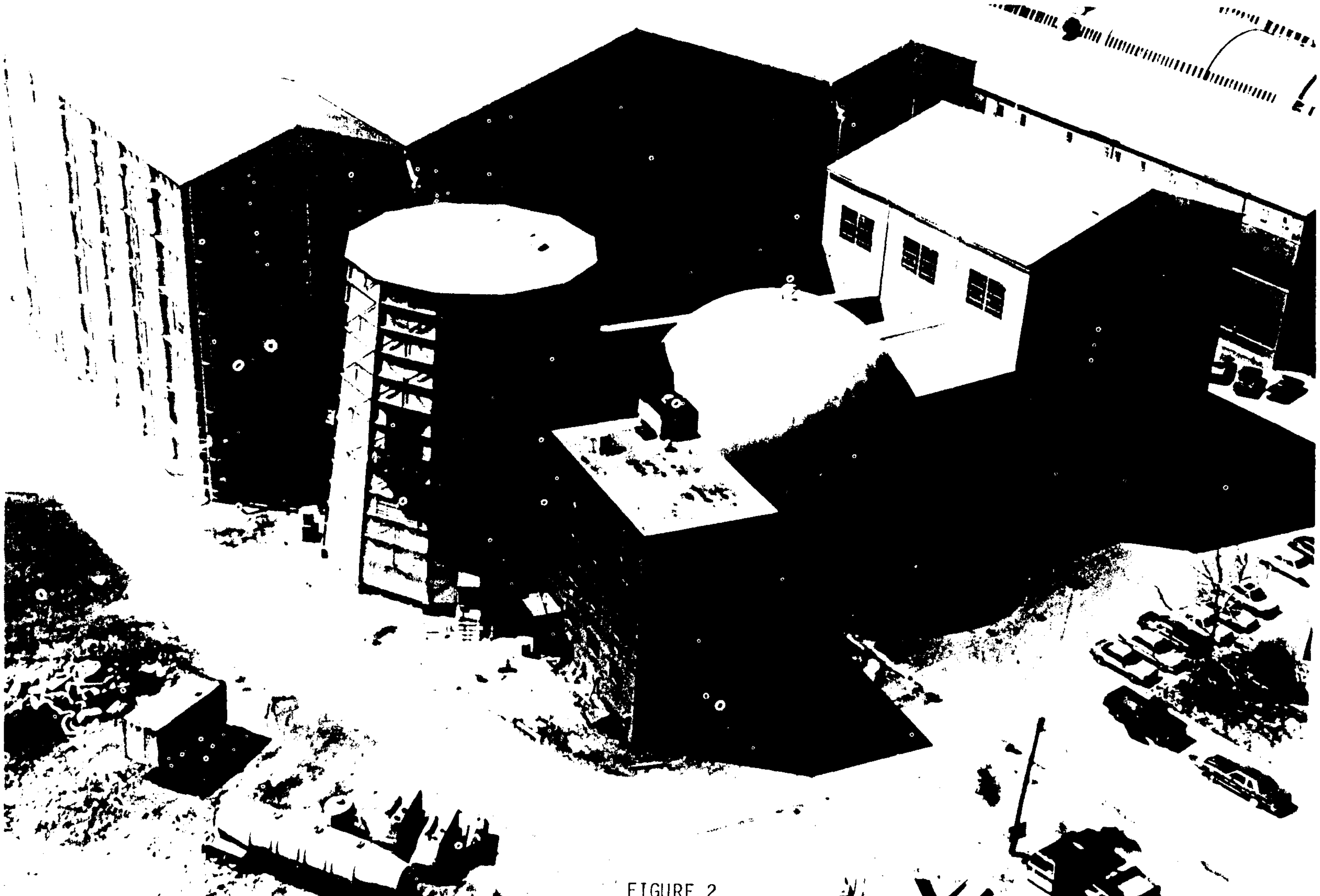


FIGURE 2

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1990 ESTIMATES

PROJECT TITLE: Rehabilitation of Central Air Systems

INSTALLATION: Lewis Research Center

FY 1990 CoF Estimate: $2,400,000

LOCATION OF PROJECT: Cleveland, Ohio

COGNIZANT HEADQUARTERS OFFICE: Office of t and Space Technology

FY 1989 AND PRIOR YEARS' FUNDING: The following prior years' funding is related to this project:

	Planning and Design	Construction	Total
Specific CoF Funding......................	$230,000	---	$ 230,000
Capitalized Investment...............	---	$33,802,000	33,802,000
Total..................................	$230,000	$33,802,000	$34,032,000

SUMMAR PURPOSE AND SCOPE:

This project provides for the rehabilitation and modification of the Lewis Research Center (LeRC) Central Air Systems to assure continued safe and reliable operation of major aeronautical research facilities. The existing system installed more than 40 years ago has been in continual use supporting essential research in the 10x10 Supersonic Wind Tunnel, the 8x6/9x15 Supersonic Wind Tunnel, the Icing Research Tunnel, the Propulsion Systems Laboratory, Propulsive Lift Facility, and various test cells in the Engine Research Building Complex. This project is included in the Wind Tunnel Revitalization plan.

PROJECT JUSTIFICATION:

The availability of reliable aeronautical propulsion research facilities is critical to the continued development of propulsion systems for subsonic and supersonic transports, hypersonic vehicles, and other advanced systems for commercial and military applications. Specific justification for each element of this project are:

A, A recent inspection of the 125 pounds per square inch gauge (psig) Combustion Air Compressor rotors revealed that more than 40 percent of the rivets are cracked and not able to operate at design loads. To assure that this system provides safe and reliable service, the rotors must be replaced.

B. The piping components in the 40 and 150 psig Central Air System are severely corroded and must be replaced to meet the requirements of the National Piping Codes.

C. The intercoolers, aftercoolers, and vessels of the Process System Heat Exchangers are severely corroded and no longer meet the requirements of the National Pressure Vessels Codes and must be replaced or repaired.

D. Cooling Towers 1 and 4 are wooden construction and are physically located at a site that makes them highly susceptible to fire. Because there are no backup water systems, loss of these towers would result in major delays. An internal fire protection/suppression system is required to assure integrity.

E. The service air underground piping along Walcott Road must be extended to connect with the Taylor Road lines. This connection will complete the service air network for the central and south areas.

IMPACT OF DELAY:

Delay of this project will significantly increase the risk of unscheduled and lengthy shutdowns of one or more major aeronautical research facilities or personnel injury due to equipment failure. The current and planned schedule of propulsion testing is dependent on a high degree of integrity and availability of the research facilities and the central process systems.

PROJECT DESCRIPTION:

This project provides:

A. Replacement of the deteriorating 125 psig combustion air compressor (C3) riveted rotor with a new welded construction rotor, replacement of compressor bearings and seals, and rewinding the 4,000 horsepower (hp) compressor motor:

B. Removal of existing deteriorated piping and asbestos insulation within the 40 psig Combustion Air System located outside the west wall of the Central Air Equipment Building (64) and installing new piping (ranging from 12" diameter to 54" diameter), new bellows type expansion joints, butterfly valves, pipe supports, and weatherproof covering:

C. Rehabilitate leaking tube bundles and shells in the heat exchangers that meet American Society for Mechanical Engineers (ASME) Boiler and Pressure Vessel Section VIII codes requirements;

D. Retrofit existing wood-framed cooling towers 1 and 4 with a dry, deluge type fire protection system;

E. Install approximately 2,000 ft. of eight inch piping with necessary manholes along Walcott Road to complete the Lewis Center's service air loop.

PROJECT COST ESTIMATE:

This cost estimate is based on a completed preliminary engineering report.

	Unit of Measure	Quantity	Unit cost	cost
Land Acquisition	---	---	---	---
Construction	---	---	---	$2,400,000
Rehabilitate Central Air Compressor	LS	---	---	500,000
Rehabilitate Central Air Piping	LS	---	---	700,000
Rehabilitate Heat Exchangers	LS	---	---	300,000
Modify Cooling Towers	LS	---	---	570,000
Modify Service Air System	LS	---	---	330,000
Fallout Shelter (not feasible)	---	---	---	---
Total				$2,400,000

LIST OF RELATED GRAPHICS:

Figure 1 - Location Plan
Figure 2 - Rehabilitation of Central Air Systems Overview

OTHER EQUIPMENT SUMMARY

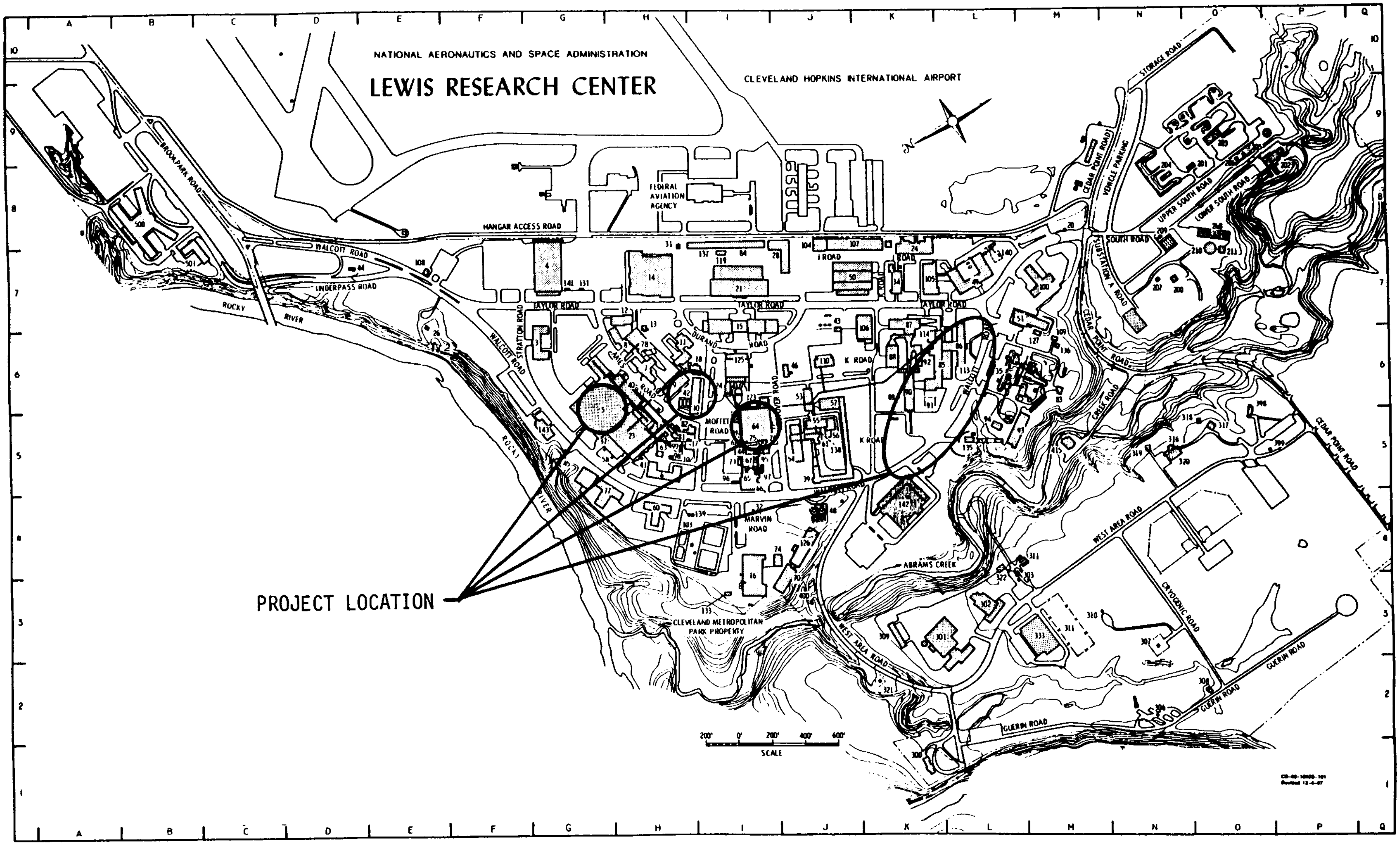
No other equipment is required to complete this project.

FUTURE COF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

Additional CoF funding estimated at $7.9M (FY 1991) and $1.4M (FY 1992) will be required to complete this project.

LEWIS RESEARCH CENTER
FISCAL YEAR 1990 ESTIMATE

REHABILITATION OF CENTRAL AIR SYSTEMS



LOCATION PLAN

FIGURE 1

REHABILITATION OF CENTRAL AIR
WIND TUNNEL REVITALIZATION PROGRAM

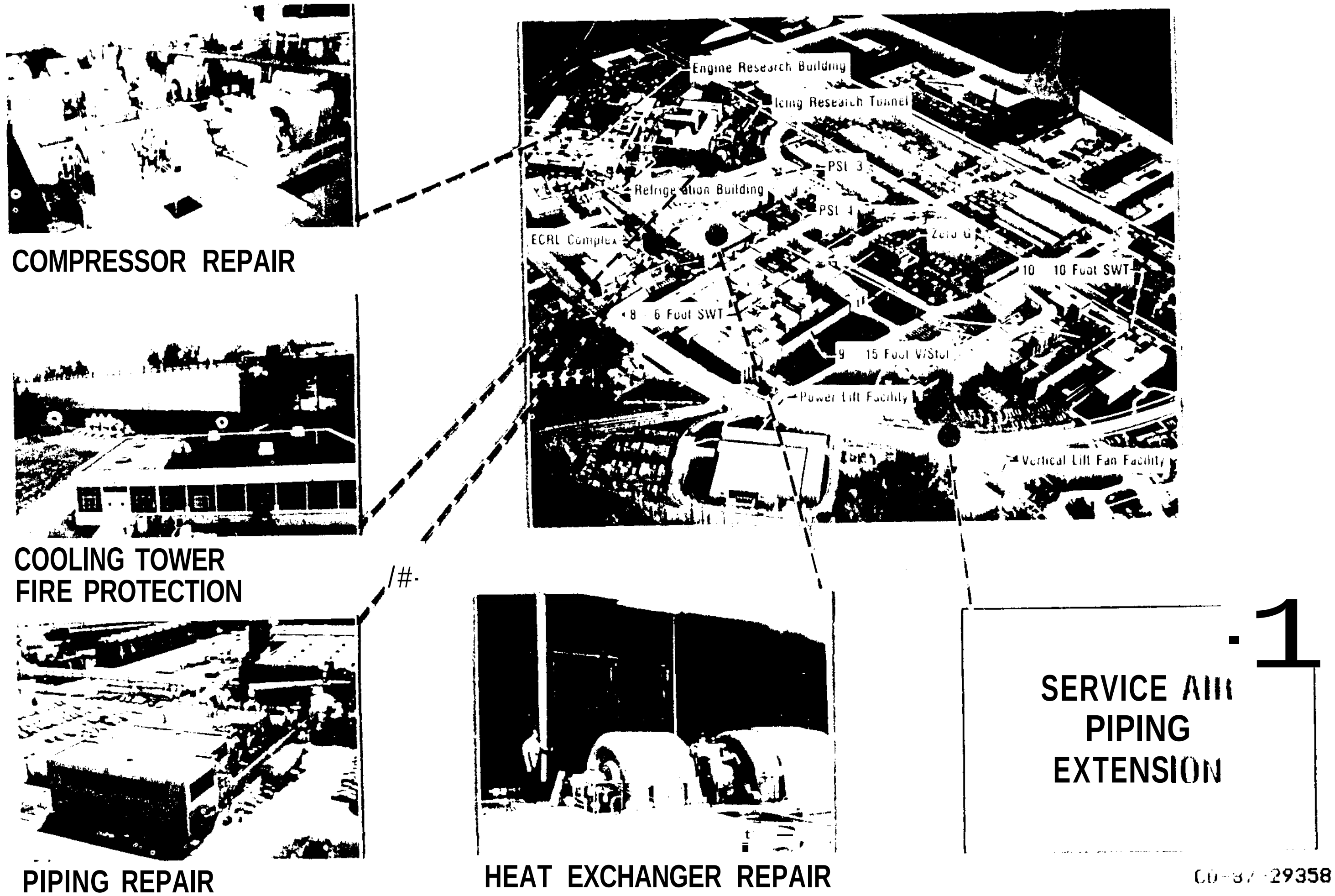


FIGURE 2

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1990 ESTIMATES

PROJECT TITLE: Rehabilitation of Central Refrigeration Equipment

INSTALLATION: Lewis Research Center

FY 1990 CoF Estimate: $7,200,000

LOCATION OF PROJECT: Cleveland, Ohio

COGNIZANT HEADQUARTERS OFFICE: Office of Aeronautics and Space Technology

FY 1989 AND PRIOR YEARS' FUNDING: The following prior years' funding is related to this project:

	Planning and Design	Construction	Total
Specific CoF Funding.....................	$686,000	---	$ 686,000
Capitalized Investment...................	---	$3,131,000	$3,131,000
Total................................	$686,000	$3,131,000	$3,817,000

SUMMARY PURPOSE AND SCOPE:

This project provides for the rehabilitation of the Central Refrigeration Equipment system to ensure the continued safe and reliable operation of the LeRC Icing Research Tunnel (IRT) and the Engine Components Research Laboratory (ECRL). The test facilities supported by the central refrigeration system are essential to the development of all-weather aircraft and advanced propulsion systems for the nation's civilian and military aeronautics needs. This project is included in the Wind Tunnel Revitalization plan.

PROJECT JUSTIFICATION:

The central refrigeration system at Lewis Research Center (LeRC) is the only source of refrigeration for the Icing Research Tunnel (IRT), and provides extensive environmental cooling for numerous systems, laboratories, and offices in the Engine Component Research Laboratory. The existing equipment is over 44 years old, and without rehabilitation, modernization and/or replacement, the risk of frequent system failures will significantly increase. The equipment currently malfunctions on a frequent basis and without attention will become worse with time.

IMPACT OF DELAY:

Delay of the project increases the risk of unscheduled down times due to equipment failures. The resulting impact for IRT will be the delay of programs associated with the development of all-weather capability for advanced rotocraft such as the V-22 tiltrotocraft and other high performance aircraft of the future. The impact will also be felt by programs supporting commercial aircraft development by companies such as Boeing and McDonnell Douglas. Delaying these programs could affect the safety of commercial aviation in the United States.

PROJECT DESCRIPTION:

This project includes:

- Compressor rehabilitation and controls, consisting of reconditioning 11 of the existing 13 refrigeration compressors including replacing the seals; reconditioning the bearings, drive motor, gearbox speed increasers, and existing valves; installation of compressor isolation valves for servicing; installation of a hot-gas bypass on each compressor to enhance tunnel warm-up; and installation controls for automatic remote operation of the compressors.

- Building modifications consisting of roof and support structure replacement; installation of a bridge crane; upgrading the control room, building plumbing, heating, and ventilating; control room conditioning; and relocating the natural gas compressor to a new building with utilities outside Building 9.

- Electrical modifications, consists of replacing switchgear, wiring and lighting and building rewiring after the roof is replaced.

- Cooling tower equipment rehabilitation, consists of reconditioning the pumps, piping, and valves.

PROJECT COST ESTIMATE:

This cost estimate is based on a preliminary engineering report.

	Unit of Measure	Quantity	Unit cost	cost
Land Acquisition	---	---	---	---
Construction	---	---	---	~7,200,000
Rebuild Compressors	EA	11	$379,090	4,170,000
Replace Refrigeration Building Roof	SF	12.000	107	1,288,000
Replace Switchgear	LS	---	---	1,322,000
Gas Compressor Building (Blast/Resistant)	SF	900	381	343,000
Fire Protection	LS	---	---	77,000
Fallout Shelter (not feasible)	---	---	---	---
Total				$7,200,000

LIST OF RELATED GRAPHICS:

Figure 1 - Location Plan
Figure 2 - Project Elements

OTHER EQUIPMENT SUMMARY:

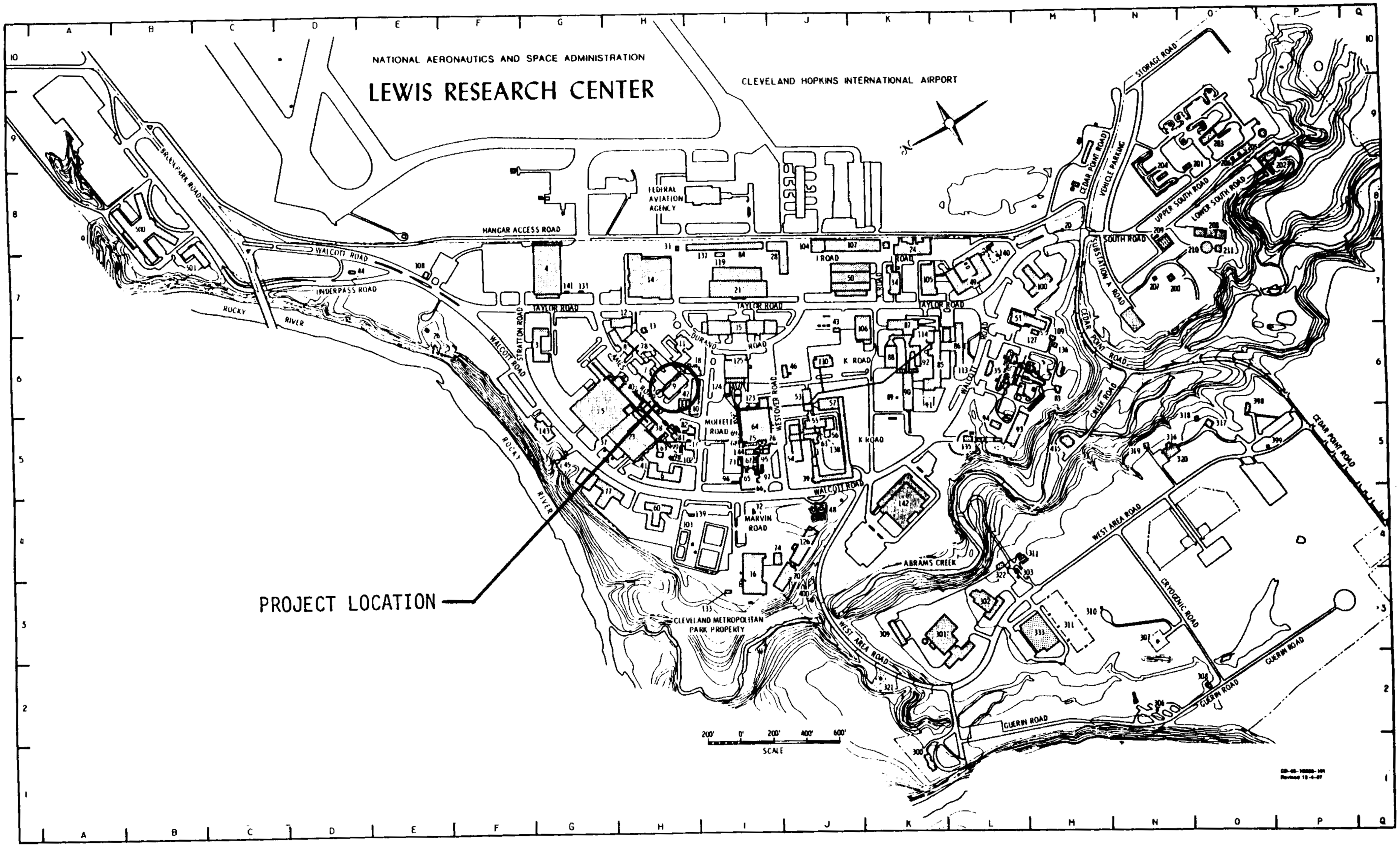
No other equipment is required to complete this project.

FUTURE CoF FUNDING REQUIRED TO COMPLETE THIS PROJECT:

No future CoF funding is required to complete this project.

LEWIS RESEARCH CENTER
FISCAL YEAR 1990 ESTIMATE

REHABILITATION OF CENTRAL REFRIGERATION EQUIPMENT



LOCATION PLAN

FIGURE 1

LEWIS RESEARCH CENTER
FISCAL YEAR 1990 ESTIMATE

REHABILITATION OF CENTRAL REFRIGERATION EQUIPMENT

CENTRAL REFRIGERATION BUILDING
WIND TUNNEL REVITALIZATION PROGRAM

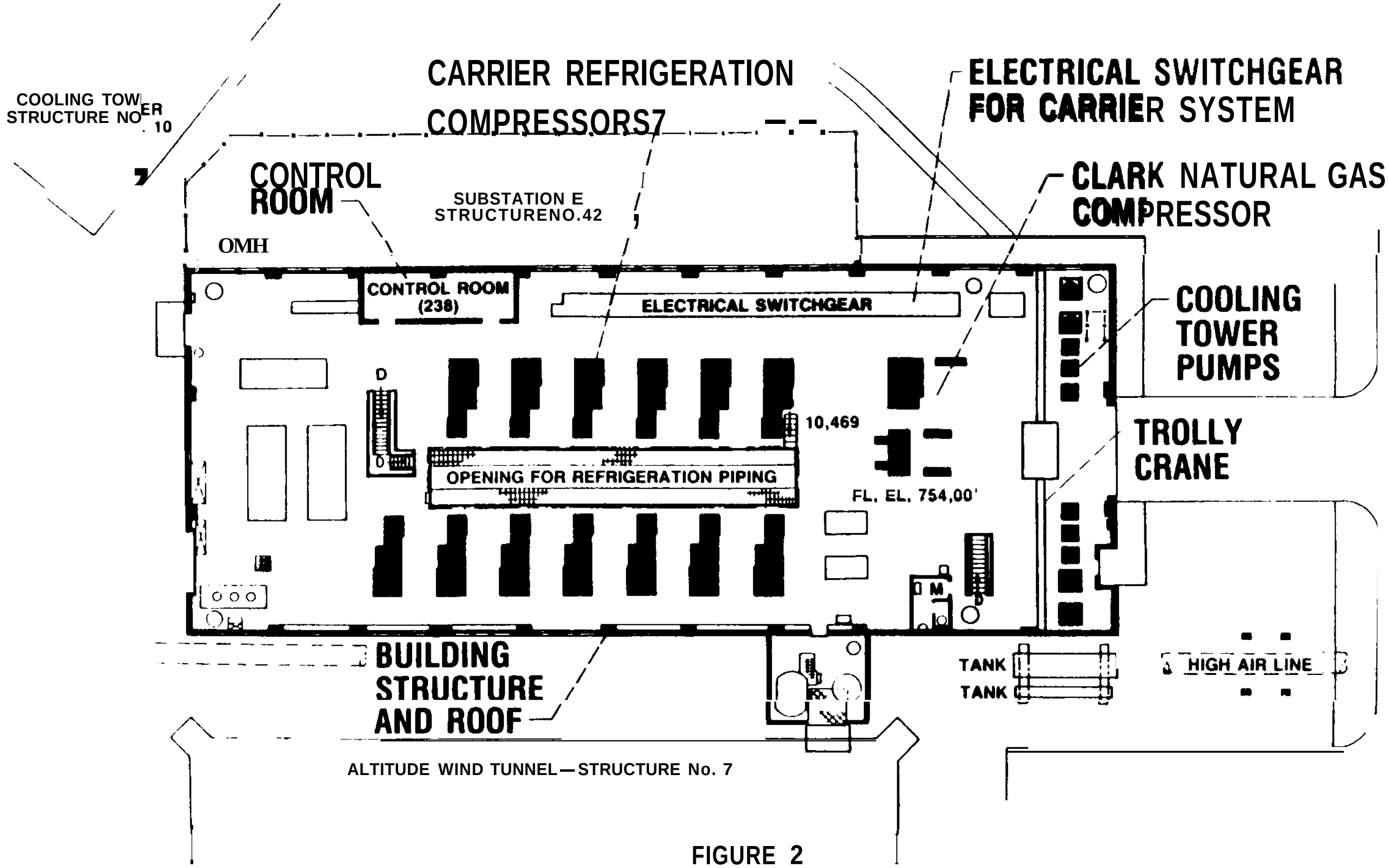


FIGURE 2

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1990 ESTIMATES

PROJECT TITLE: Rehabilitation of 8x6 Supersonic and 9x15 Low-Speed Wind Tunnels

INSTALLATION: Lewis Research Center

FY 1990 CoF Estimate: $6,800,000

LOCATION OF PROJECT: Cleveland, Ohio

COGNIZANT HEADQUARTERS OFFICE: Office of Aeronautics and Space Technology

FY 1989 AND PRIOR YEARS' FUNDING: The following prior years' funding is related to this project:

	Planning and Design	Construction	Total
Specific CoF Funding......................	$699,000	---	$ 699,000
Capitalized Investment...................	---	$12,115,000	$12,115,000
Total...................................	$699,000	$12,115,000	$12,814,000

SUMMARY PURPOSE AND SCOPE:

The project provides for the rehabilitation and modification of the 8x6 Supersonic and 9x15 Low-Speed Wind Tunnels (SWT) and (LSWT) to ensure continued safe and reliable operation. The facilities in this project are essential for supporting the future research programs associated with the development of advanced aeropropulsion and launch vehicle systems. This project is included in the Wind Tunnel Revitalization plan.

PROJECT JUSTIFICATION:

The 8x6/9x15 wind tunnel complex is NASA's only transonic propulsion wind tunnel used to develop advanced aeropropulsion systems for civilian and military application. Research in this complex includes low speed Advanced Short Takeoff and Vertical Landing (ASTOVAL) for military application, advanced Turboprop initiatives and the development of expendable launch vehicles associated with NASA's space related programs. Future use of the tunnels include research associated with the airbreathing propulsion systems for the National Aero-Space Plane (NASP) and the Air Force Advanced Tactical Fighter (ATF).

Quality of experimental data is of extreme importance for research programs related to the development of advanced propulsion systems both in the low speed turboprop regime and the advanced high Mach number flight regions. In order to properly evaluate these complex propulsion systems, the present tunnel air flow quality requires improvement. Air flow turbulence and acoustic signatures of both tunnels must be optimized. Programs associated with the development of advanced propulsion systems for high Mach number flight, such as NASP, will require fuels not presently available. This project will provide for the establishment of a high pressure gaseous oxygen supply system needed to support the NASP research. Accomplishment of this rehabilitation project is mandatory to support these programs.

IMPACT OF DELAY:

Delays due to failures that could occur if this project is not performed; e.g., failures of the electrical power feed cabling and/or the air dryer system will severely impact the accomplishment of the NASP, ATF and ASTOVAL research programs. Further delays to carrying out these renovation and upgrades will prevent the United States from being competitive and a leader in the development of propulsion systems associated with advanced aircraft.

PROJECT DESCRIPTION:

This project provides for: the rehabilitation of the feeder cables and switching system for the drive motor including replacement of 18 existing feeder cables; replacement or repair of the cable supports; replacement of termination and insulation system components at the transformers and drive motors; and repair of the cable tunnel. Also included is the addition of new motor starters and protective devices. The rehabilitation of the Air Dryer Reactivation System includes replacement of systems components and installation of additional alumina dryer medium. The modification of tunnel flow path aerodynamic components includes installation of flow deflector turning vanes and flow straightener structures and screens within the tunnel flow path ducting, and new fairings for the compressor inlet and air dryer discharge. Other modifications include: a tunnel model fuel supply system to supply high pressure oxygen gas to the model test chamber; generic mechanical support systems, hydraulic and pneumatic service systems with the controls necessary to provide an off-line model preparation and checkout capability; and the addition of an equipment room for the 9x15 LSWT.

PROJECT COST ESTIMATE:

This cost estimate is based on a preliminary engineering report.

	Unit of Measure	Quantity	Unit cost	cost
Land Acquisition................................	---	---	---	---
Construction....................................	---	---	---	$6,800,000
Rehabilitation of Electrical Cabling/Switching..	LS	---	---	1,655,000
Rehabilitation/Automation of Air Dryer..........	LS	---	---	1,045,000
Improve Flow Quality...........................	LS	---	---	2,410,000
Rehabilitation of Fuel System...................	LS	---	---	810,000
Modifications for Model Checkout................	LS	---	---	755,000
Addition of 9x15 LSWT Equipment Room...........	LS	---	---	125,000
Equipment.......................................	---	---	---	---
Fallout Shelter (not feasible)...................	---	---	---	---
Total...				$6,800,000

LIST OF RELATED GRAPHICS:

Figure 1 - Location Plan
Figure 2 - 8x6/9x15 Wind Tunnel Complex Plan - Proposed Aerodynamic Enhancements

OTHER EQUIPMENT SUMMARY:

No other equipment is required to complete this project.

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

No future CoF funding is required to complete this project.

LEWIS RESEARCH CENTER
FISCAL YEAR 1990 ESTIMATE

REHABILITATION OF 8X6/9X15 WIND TUNNEL COMPLEX

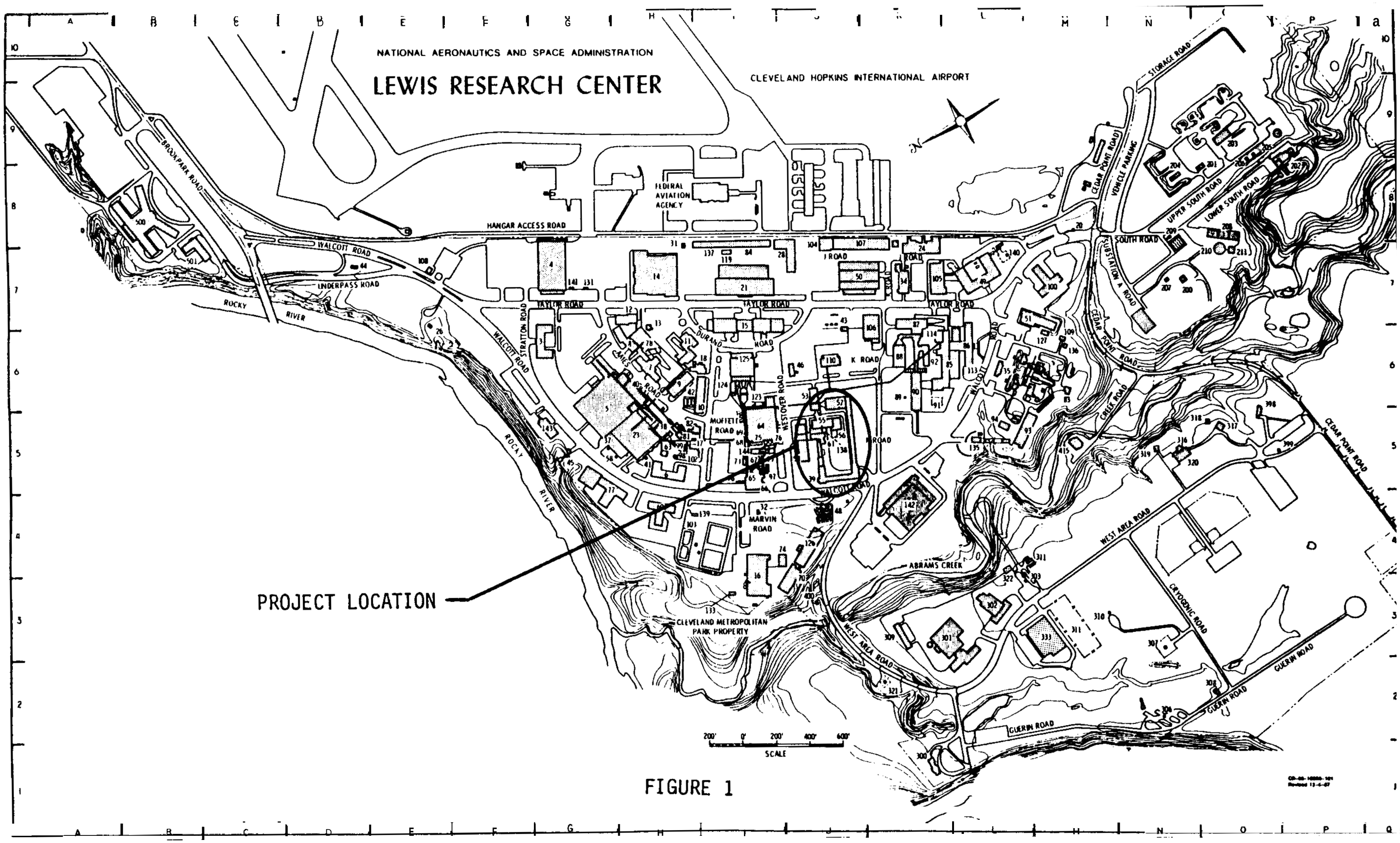


FIGURE 1

LOCATION PLAN

LEWIS RESEARCH CENTER
FISCAL YEAR 1990 ESTIMATE

REHABILITATION OF 8X6/9X15 WIND TUNNEL COMPLEX

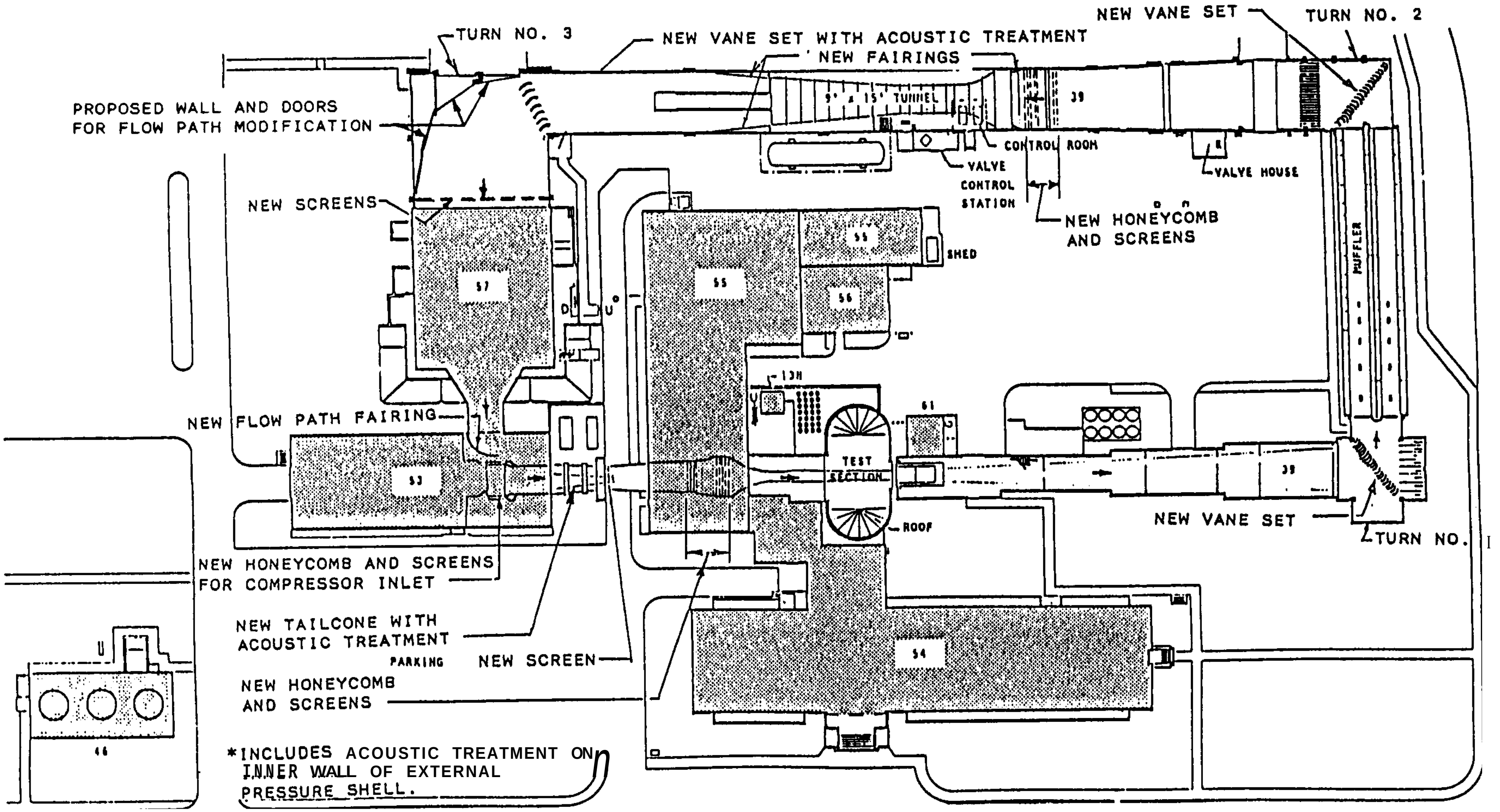


FIGURE 2

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1990 ESTIMATES

PROJECT TITLE: Rehabilitation of Hypersonic Tunnel, Plum Brook Station (PBS)

INSTALLATION: Lewis Research Center

FY 1990 CoF Estimate: $4,100,000

LOCATION OF PROJECT: Sandusky, Ohio

COGNIZANT HEADQUARTERS OFFICE: Office of Aeronautics & Space Technology

FY 1989 AND PRIOR YEARS' FUNDING: The following prior years' funding is related to this project:

	Planning and Design	Construction	Total
Specific CoF Funding......................	$410,000	---	$ 410,000
Capitalized Investment....................	---	$6,088,000	6,088,000
Total..................................	$410,000	$6,088,000	$6,498,000

SUMMARY PURPOSE AND SCOPE:

This project rehabilitates the Hypersonic Tunnel (HT) (3411) at Plum Brook Station (PBS). The HT provides unique test capabilities for propulsion, aerodynamics and aerothermal structure in support of the National Aero-Space Plane (NASP) Program and evolving generic hypersonic and high-speed technology programs. The facility was constructed in 1967 and was placed on standby in 1974. This project will provide for the rehabilitation of the existing facility to restore the originally designed Mach 5 to 7 free-jet, blow-down capability. This project is included in the Wind Tunnel Revitalization Plan.

PROJECT USTI ICATION

The Hypersonic Tunnel (HT) is the largest, non-vitiated hypersonic propulsion facility in this country. The tunnel is a blow-down, free-jet facility capable of Mach 5, 6, and 7 with true temperature, true altitude, and true air composition simulation. Run times range from about 45 seconds to five minutes. Although the facility was initially constructed for large-scale propulsion testing, its unique capabilities make it suitable to support large-scale aerodynamics and thermal structures testing. Restoration of its original Mach 5 to 7 free-jet capability is essential to support planned hypersonic programs. This facility is an integral and critical component for exploring new technologies such as the National Aero-Space Plane (NASP) which involves development of an advanced air-breathing propulsion system far beyond current capabilities.

Future generic hypersonic and high-speed technology efforts will also require the capabilities of the HT. This long term research effort will explore a large number of research problem areas including inlets and ducting, combustors, nozzles, thermal management, propulsion management and component integration and validation.

IMPACT OF DELAY:

This project should be implemented now to make the test capabilities of HT available as early as possible. The inclusion of HT in NASP and evolving generic high-speed technology programs is required to restore and upgrade hypersonic facilities test capabilities in support of National programs. The impact of delaying this project would be added cost and nonavailability of this facility for critical high-speed/hypersonic technology research.

PROJECT DESCRIPTION:

This project will rebuild the gaseous nitrogen (GN_2) induction heater, modify the hot train components, install a new radiation shutter valve, refurbish the test chamber and steam ejector train, and restore the facility buildings. Various support systems such as the domestic water, industrial water, cooling tower water and carbon dioxide (CO_2) fire suppression systems, building heating, ventilation, and air conditioning (HVAC) and control room pressurization systems will be rehabilitated. To generate the high Mach No. air flows, the GN_2 rail car system, the gaseous oxygen (GO_2) system storage bottles, piping and liquid oxygen (LOX) vaporizer, and demineralized water cooling tanks, pumps, and piping must be repaired.

In addition, several essential support buildings and systems must be rehabilitated including the steam boiler Building (5231), and the steam accumulators and distribution piping. Existing deteriorated asbestos insulation on the steam lines and components will be removed and disposed of per Environmental Protection Agency (EPA) guidelines. Also, the liquid nitrogen (LN_2) Transfer Building (3233), vaporizer and piping must be reconditioned to support the test facility rail car and storage bottles.

The B Control Building (5411) requires modernization and restoration of the control and data acquisition systems. Also a new smoke detector and a wet pipe fire sprinkler system will be installed in the control bay area.

PROJECT COST ESTIMATE:

This cost estimate is based on a preliminary engineering report.

	Unit of Measure	Quantity	Unit cost	Cost
Land Acquisition	---	---	---	---
Construction	---	---	---	$4,100,000
Rehabilitate GN_2 Heater, Hot Train, Test Chamber	LS	---	---	200,000
Rehabilitate Process Systems	LS	---	---	780,000
Rehabilitate Steam System	LS	---	---	1,190,000
Remove Asbestos and Polychlorinated Biphenyl (PCB)	LS	---	---	580,000
Rehabilitate Electrical Systems	LS	---	---	480,000
Rehabilitate Instrumentation and Controls	LS	---	---	680,000
Rehabilitate Facility Structures	LS	---	---	190,000
Fallout Shelter (not feasible)	---	---	---	---
Total				$4,100,000

LIST OF RELATED GRAPHICS:

Figure 1 - Location Plan
Figure 2 - Project Elements

OTHER EQUIPMENT SUMMARY:

Research and Development funded equipment in the amount of $2.2M is required to complete this project.

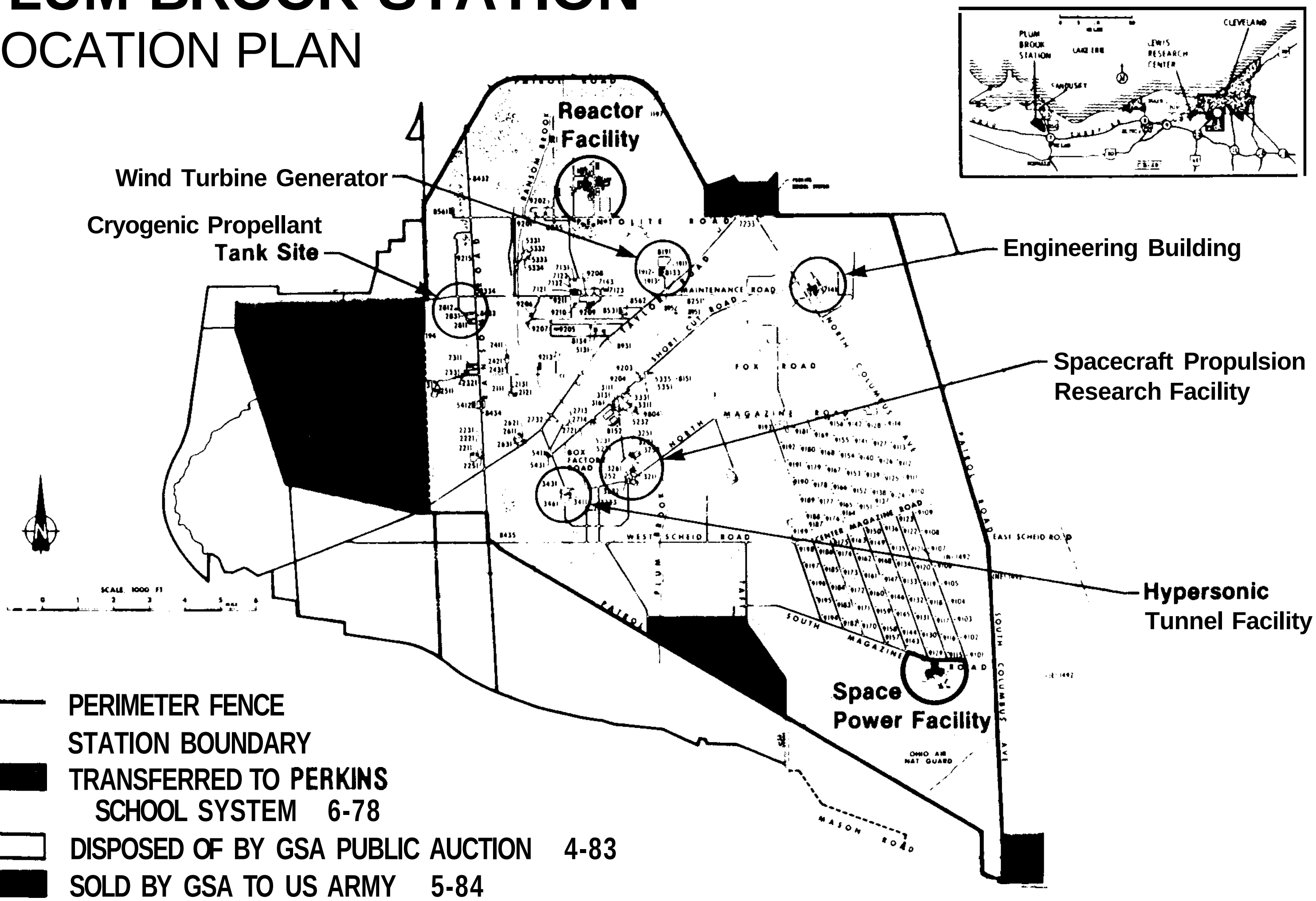
FUTURE COF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

No future CoF funding is required to complete this project.

LEWIS RESEARCH CENTER
FISCAL YEAR 1990 ESTIMATE

REHABILITATION OF HYPERSONIC TUNNEL FACILITY

PLUM BROOK STATION
LOCATION PLAN



PERIMETER FENCE
STATION BOUNDARY
TRANSFERRED TO PERKINS SCHOOL SYSTEM 6-78
DISPOSED OF BY GSA PUBLIC AUCTION 4-83
SOLD BY GSA TO US ARMY 5-84
DISPOSITION BY GSA PENDING SCHEDULED 1985

FIGURE

CF 7-44

CD-84-15294

NASA
C-87-0909a

LEWIS RESEARCH CENTER
FISCAL YEAR 1990 ESTIMATE

REHAOILITATION OF HYPERSONIC TUNNEL FACILI IY

PLUM BROOK HYPERSONIC TUNNEL FACILITY

WIND TUNNEL REVITALIZATION PROGRAM

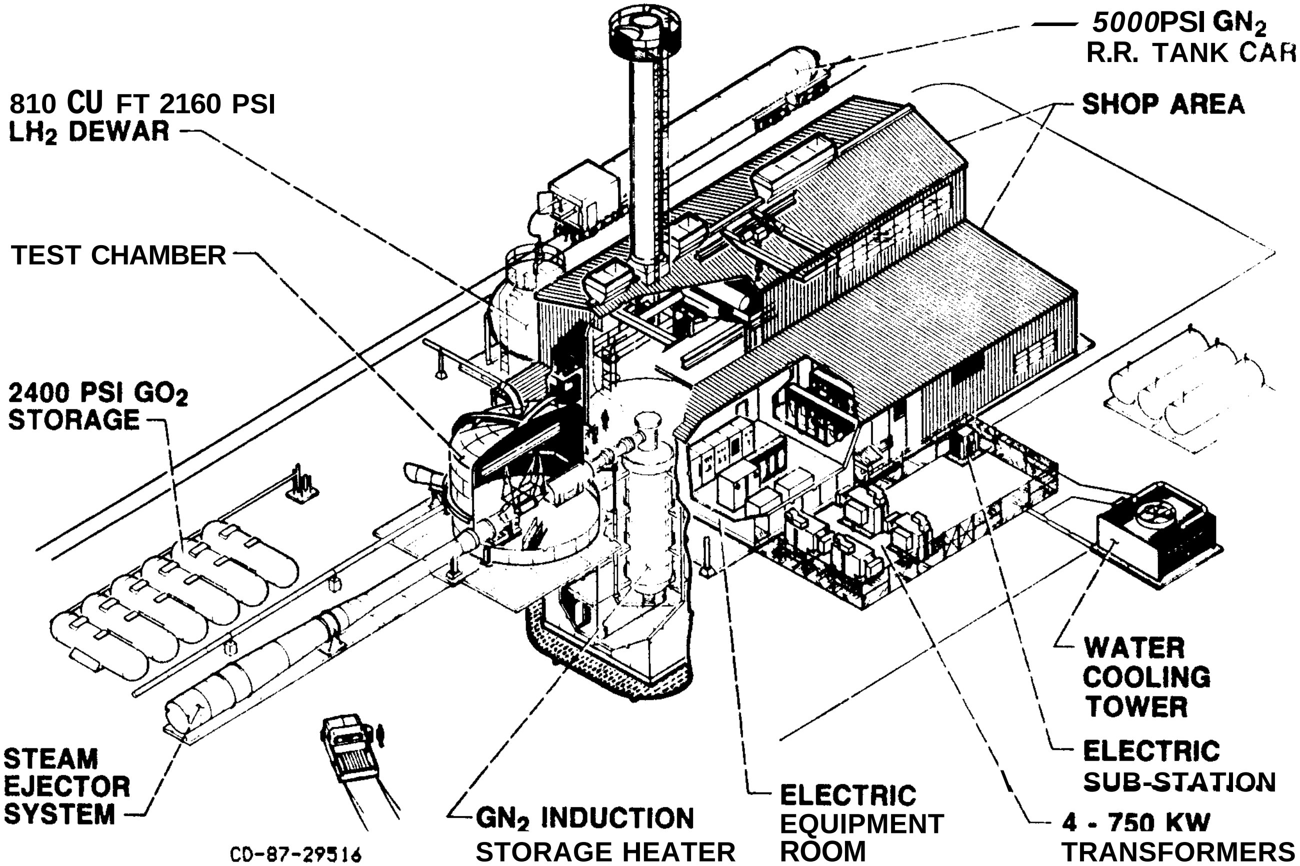


FIGURE 2

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1990 ESTIMATES

PROJECT TITLE: Repair and Modernization of the 12-Foot Pressure Wind Tunnel

INSTALLATION: Ames Research Center

FY 1990 CoF Estimate: $27,600,000

LOCATION OF PROJECT: Moffett Field, Santa Clara County, California

COGNIZANT HEADQUARTERS OFFICE: Office of Aeronautics and Space Technology

FY 1989 AND PRIOR YEARS' FUNDING: The following prior years' funding is related to this project:

	Planning and Design	Construction	Total
Specific CoF Funding........................	$8,466,000	$36,114,000	$44,580,000
Capitalized Investment.................	---	10,190,535	10,190,535
Total.....................................	$8,466,000	$46,304,535	$54,770,535

SUMMARY PURPOSE AND SCOPE:

This project continues the repair and modernization of the 12-Foot Pressure Wind Tunnel. The total project will return the tunnel to its original operating capability of six atmospheres, modernize tunnel control systems, model preparation areas, add new capability to make changes on test models without depressurizing the entire tunnel and modernize model supports within the tunnel to enable a larger range of tests. The facility is required to support the Nation's rapidly expanding requirements for low speed, low turbulence level, high quality flow and high

Reynolds Number aeronautics testing. This increment of construction completes the replacement of the pressure vessel shell and supports, and the test section isolation system which will allow model access without depressurization of the tunnel circuit. Included is the rehabilitation and modernization of the N-206 support building. This project is a primary component of NASA's Wind Tunnel Revitalization Plan.

PROJECT JUSTIFICATION:

The 12-Foot Pressure Wind Tunnel is a subsonic pressure wind tunnel of national importance which has provided critical high Reynolds Number test capability to NASA, DoD, and the U.S. aircraft industry since 1946. The tunnel has an exceptionally low free stream turbulence level, high quality flow, wide range of flight regimes, and large test section capability for high fidelity models. Since 1965, essentially every military aircraft and civil transport has been tested in the 12-Foot Pressure Wind Tunnel. The discovery of severe, unrepairable weld defects forced the derating of the tunnel to one atmospheres of pressure in September 1986 to preclude the possibility of a catastrophic failure. Without repair of the pressure shell for six atmosphere pressure operation, the 12-Foot Pressure Wind Tunnel cannot be used to provide critical high angle of attack, high lift, and laminar flow data for the development of the Nation's advanced military and commercial aircraft.

The 12-Foot Pressure Wind Tunnel is a high-demand facility with tests typically scheduled eight to 16 months in advance with two-shifts-per-day operation. During its operation, the productivity was severely limited because the entire tunnel circuit had to be depressurized for model changes or adjustments. In addition, the inability to assemble, check out, and calibrate models outside the test section and the use of outdated and obsolete model support systems and controls severely hampered and limited efficient utilization of the tunnel. The modernization portion of this project will result in a significant increase in productivity with installation of a test section pressure isolation system, a modern measurement and automation system, and dedicated model preparation and calibration areas.

IMPACT OF DELAY:

The backlog of important tests continues to grow as the repair and modernization of this facility progresses. Constraints have been imposed on important aeronautical research and development which contribute to further erosion of the U.S. aeronautical competitive position relative to foreign competition and national defense. Completion of this project is essential at this time.

PROJECT DESCRIPTION:

This increment includes the replacement of the pressure shell and support structure, and the installation of a new spherical rotating test section plenum to provide pressure isolation allowing model access without depressurizing the entire tunnel. This will markedly increase productivity and reduce the cost per test. The new shell will be constructed as an American Society for Mechanical Engineers (ASME) code-stamped vessel certified for six atmospheres operation. New model handling systems and supports; main drive power increase from 12,000 hp to 15,000 hp; a new solid state speed control; enhanced Mach Number and Reynolds Number control by modifying the countervane, inlet guide vane and main drive speed controls; and installing a new internal radiator for airstream cooling. The existing air flow cooling system will be replaced, including piping, valves, pumps, cooling tower, and controls. Modern tunnel automation and system controls will be installed to provide state-of-the-art feedback and distributed control of all systems from one central control location. The tunnel support building will be modified to include a second story addition. Two new model preparation rooms will be provided to allow buildup and checkout of models prior to installation in the test section thereby increasing tunnel productivity. The existing control room will be modernized to include raised computer flooring, visual access to the model staging area, human factors-engineered control consoles, lighting, power, and air-conditioning as required. A new computer support room and technical shops with supporting utilities will also be included. Also, the roof of the existing test section building will be raised to accommodate installation of a new 20-ton bridge crane.

PROJECT COST ESTIMATE:

This cost estimate is based on a preliminary engineering report and an independent cost analysis performed by a professional estimating firm.

	Unit of Measure	Quantity	Unit cost	cost
Land Acquisition................................	---	---	---	---
Construction....................................	---	---	---	$27,600,000
Shell Replacement.............................	LS	---	---	10,068,200
Test Section Isolation........................	LS	---	---	2,739,600
Building Modifications........................	LS	---	---	1,100,200
Internal Cooling System.......................	LS	---	---	1,200,000
Model Support Systems.........................	LS	---	---	2,000,800
Controls and Automation.......................	LS	---	---	2,430,300
Drive System Mods.............................	LS	---	---	1,617,000
Compressor System Mods........................	LS	---	---	1,677,700
Integrated System Test........................	LS	---	---	2,266,200
Construction Management/Inspection..............	LS	---	---	2,500,000
Equipment...	---	---	---	---
Fallout Shelter (not feasible)....................	---	---	---	---
Total...				$27,600,000

Note: The total estimated construction cost of the project is currently $63,714,000. This FY 1990 increment of construction was increased to offset necessary adjustment in the funding phases due to reductions in the total FY 1989 CoF appropriation,

LIST OF RELATED GRAPHICS:

Figure 1 - Location Plan
Figure 2 - Site Plan
Figure 3 - Schematic Plan

OTHER EQUIPMENT SUMMARY:

None.

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

Based on the present status of design, no future funding is anticipated at this time. However, additional funding may be required to replace support system components as final designs are completed.

NASA-AMES RESEARCH CENTER
FISCAL YEAR 1990 ESTIMATES
REPAIR AND MODERNIZATION OF THE 12-FOOT PRESSURE WIND TUNNEL

LOCATION PLAN

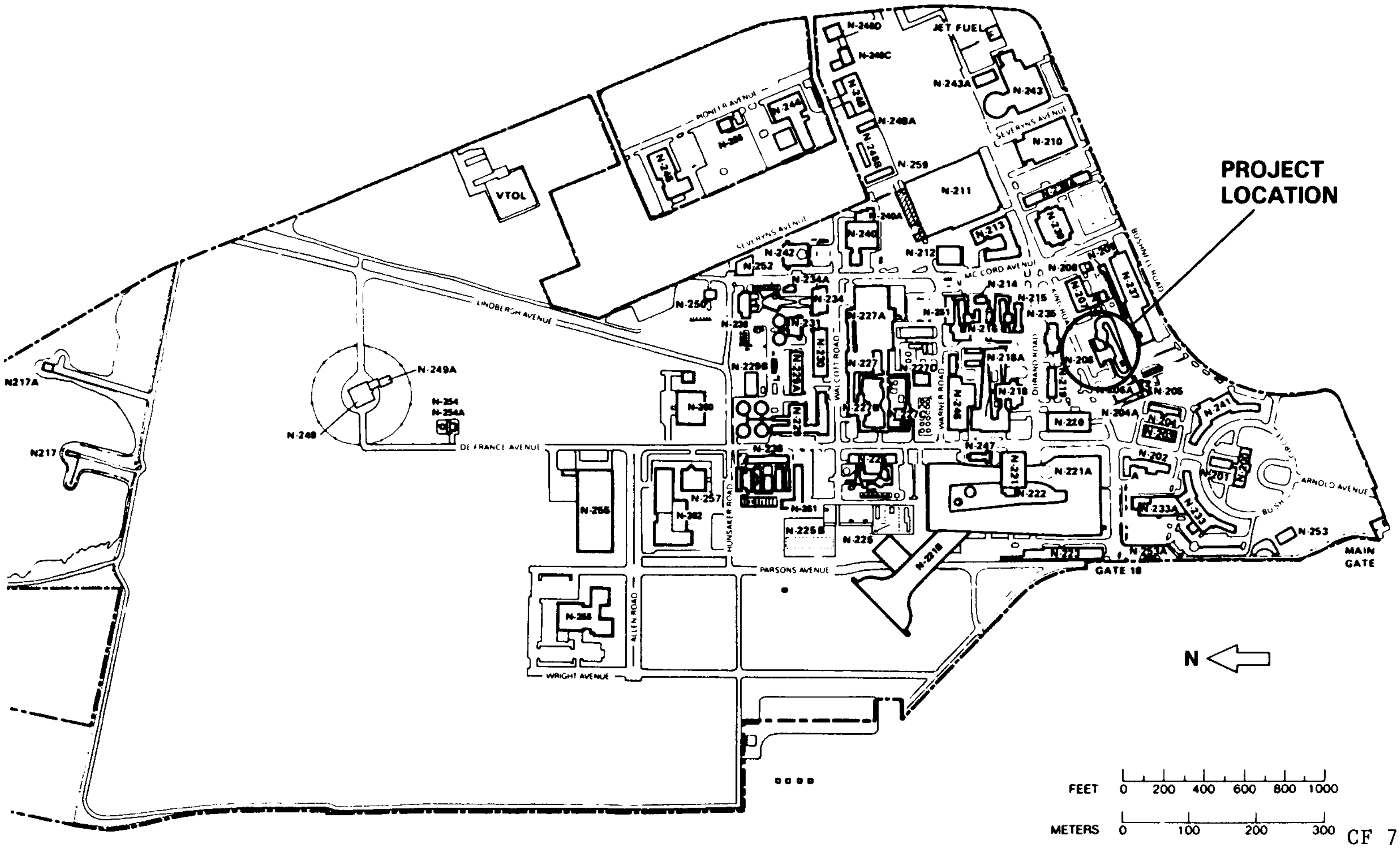


Figure 1

NASA-AMES RESEARCH CENTER
FISCAL YEAR 1990 ESTIMATES
REPAIR AND MODERNIZATION OF THE 12-FOOT PRESSURE WIND TUNNEL

SITE PLAN

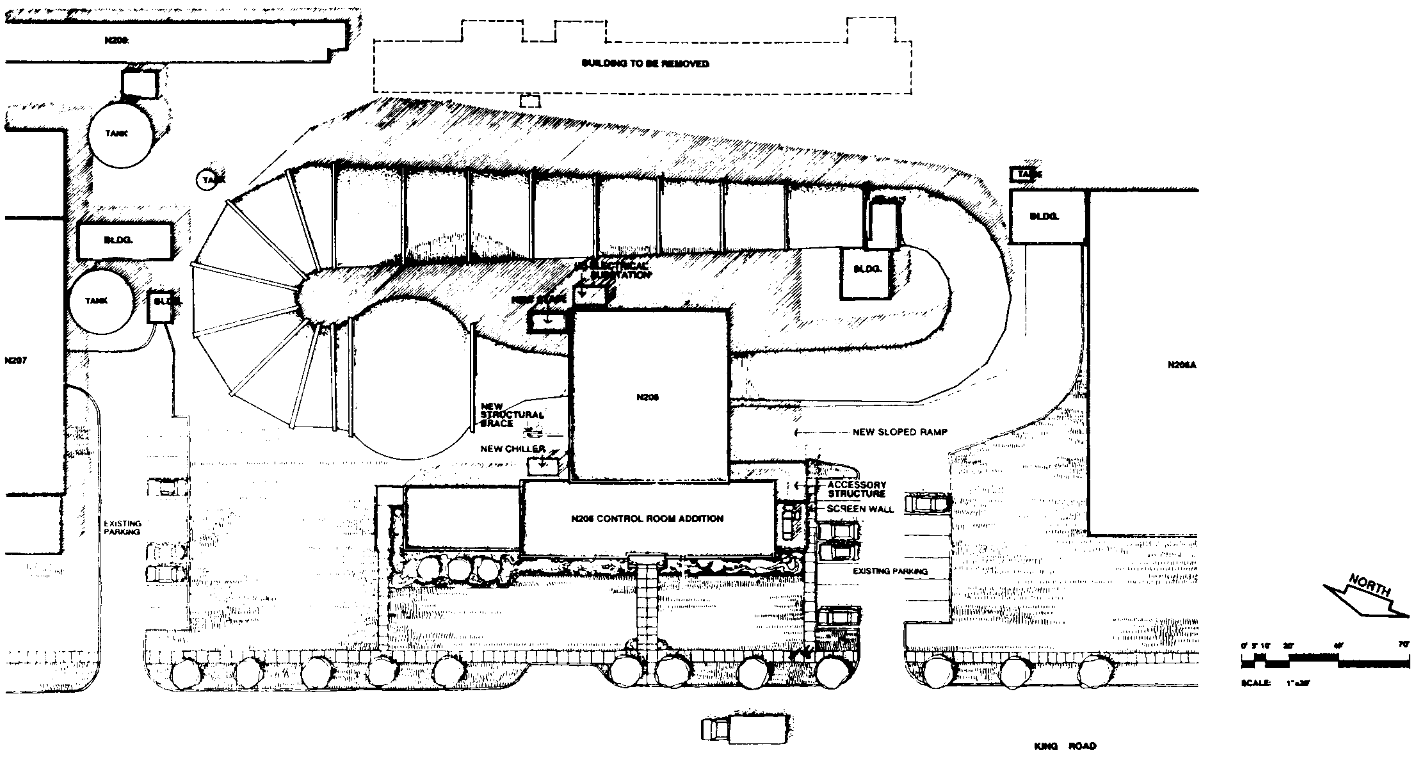
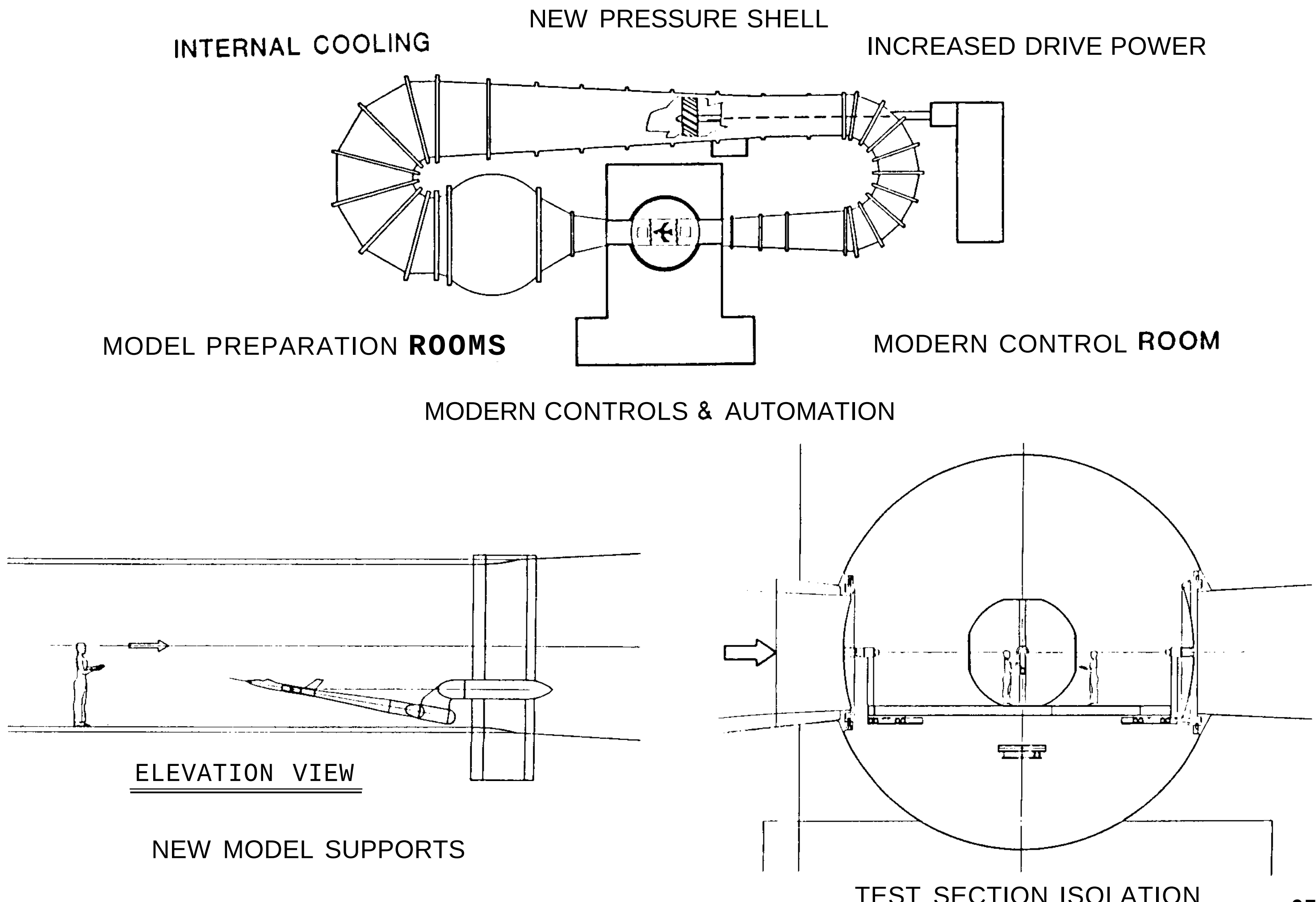


Figure 2

\ ... H CENTER
FISCAL YEA 1990 I
REPAIR AND ... N OF THE ... T PRESSURE WIND TUNNEL

SCHEMATIC PLAN



CF 7-53

Figure 3

AMES
RESEARCH CENTER

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1990 ESTIMATES

SUMMARY

AMES RESEARCH CENTER

	Amount	Page No.
Office of Aeronautics and Space Technology:		
Construction of Automation Sciences Research Facility.............	10,600,000	CF 8-1

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1990 ESTIMATES

PROJECT TITLE: Construction of Automation Sciences Research Facility

INSTALLATION: Ames Research Center

FY 1990 CoF Estimate: $10,600,000

LOCATION OF PROJECT: Moffett Field, Santa Clara County, CA

COGNIZANT HEADQUARTERS OFFICE: Office of Aeronautics and Space Technology

FY 1989 AND PRIOR YEARS' FUNDING: The following prior years' funding is related to this project:

	Planning and Design	Construction	Total
Specific CoF funding....................	$740,000	---	$740,000
Capitalized investment.................	---	---	---
Total..	$740,000	---	$740,000

SUMMARY PURPOSE AND SCOPE:

The Automation Sciences Research Facility will provide the required space for basic research and development activities associated with development of artificial intelligence (AI) and automation sciences. This technology will increase safety and productivity, and reduce costs for many projects including space science missions, aircraft automation and a permanent manned presence in space.

The facility will share common building elements and utilities with the Human Performance Research Facility for increased economy and to promote synergism between the two disciplines. Combined, the two facilities can effectively develop and verify autonomous systems and human performance procedures in evolving the right mix of human and machine synergism to solve difficult tasks: Intelligent computational systems to act as intelligence amplifiers.

PROJECT 'ICATION

Public Law PL 98-371 of July 18, 1984, (Department of Housing and Urban Developement-Independent Agencies Appropriation Act 1985) directs NASA to conduct research in advanced automation technologies to be implemented not only to promote the safety and efficiency of the Space Station but also to enhance the technical and scientific base for terrestrial applications. In response, NASA has established the Ames Research Center as the lead center to focus on artificial intelligence and systems autonomy research to be applied to space flight, aircraft automation and future scientific missions.

Ames possesses a nucleus of some of the nation's best young engineers and scientists in artifical intelligence and architecture for advanced automation. The Ames team is probably the strongest governmental artificial intelligence research group in the country today.

Existing program support activities are currently housed in part of Building N-244. However, as the program is fully staffed, the number of personnel will grow significantly, far exceeding the capacity of the current space. Temporary facilities will be used to meet short-term needs, but beyond FY 1991, those will not be adequate. Building and integrating this new facility with the Human Performance Research Laboratory (HPRL) will allow greater interaction between the two disciplines and provide for more effective incorporation of automation and autonomous systems into the Space Station and future space and aeronautics programs. Benefits include enhanced functional reliability and capability, increased crew and mission safety and a reduction of human resources necessary to operate scientific and space missions. The program requires high fidelity testbeds and direct access to symbolic computing facilities which this project will provide.

IMPACT OF DELAY:

A serious delay will occur without this facility in the application of automation techniques to national programs. Delays will seriously affect the implementation of automation concepts on such programs as Space Station operations, STS follow-on, Aero-Space Plane, aircraft flight deck modernization and autonomous operation of scientific space missions.

PROJECT DESCRIPTION:

The new facility will be a 45,200 square foot, two-story facility adjacent to the Human Performance Research Laboratory (HPRL). Existing HPRL high bay, conference room, utilities and lobby space will be shared by both facilities. The building will be a moment resisting steel-frame structure with cement plaster exterior. Site work will include a new parking area, relocation and extension of Hunsaker Road, landscaping and site drainage. Five major laboratories are to be provided as follows: Artificial Intelligence, Computer Science, Optical Information Processing, Electronics and Systems Integration. All laboratories will be provided with raised computer floors and heating, ventilating and air-conditioning. Office and staff support space for 150 people will be provided. Also to be provided are conditioned power, grounding, data communications, security and fire systems and a variable volume air-conditioning system for both the office and non-laboratory areas.

PROJECT COST ESTIMATE:

This cost estimate is based on a current Preliminary Engineering Report.

	Unit of Measure	Quantity	Unit cost	cost
Land Acquisition	---	---	---	---
Construction	---	---	---	$10,600,000
Site Development	LS	---	---	2,140,000
Architectural/Structural	SF	45,200	100.00	4,520,000
Mechanical/Electrical	SF	45,200	87.17	3,940,000
Fallout Shelter (not feasible)	---	---	---	---
Total				$10,600,000

LIST OF RELATED GRAPHICS:

Figure 1 - Location Plan
Figure 2 - Site Plan
Figure 3 - Perspective View

OTHER EQUIPMENT SUMMARY:

Additional non-colleratal equipment primarily for automated data processing equipment in the amount of $9.5M will be provided from Research and Development funding.

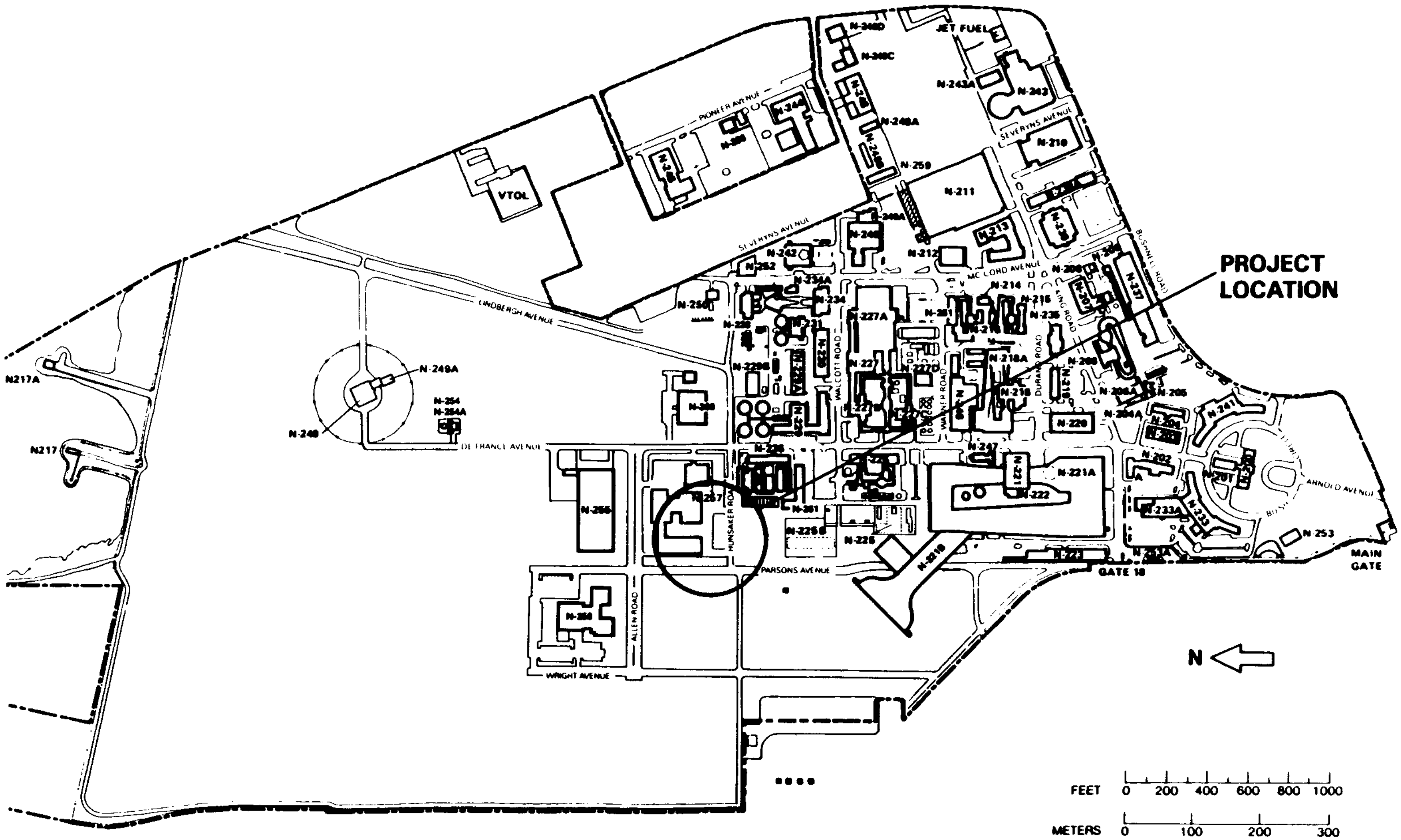
FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

No future CoF funding is required to complete this project.

NASA–Ames Research Center

FISCAL YEAR 1990 ESTIMATES
CONSTRUCTION OF THE AUTOMATION SCIENCES RESEARCH FACILITY

LOCATION PLAN



CF 8-5

Figure 1

NASA-AMES RESEARCH CENTER
FISCAL YEAR 1990 ESTIMATES
AUTOMATION SCIENCES RESEARCH FACILITY

SITE PLAN

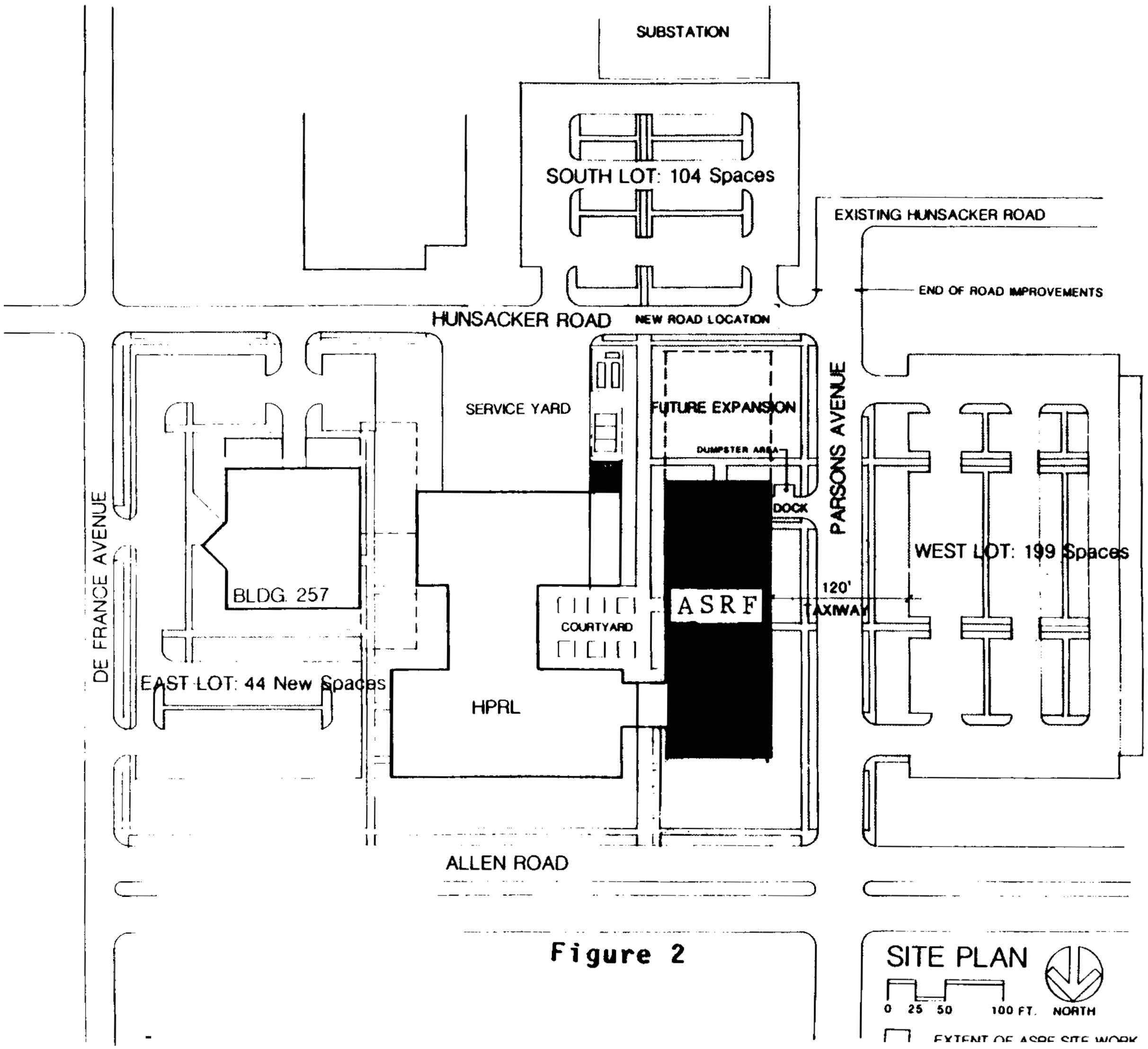


Figure 2

NASA-AMES RESEARCH CENTER
FISCAL YEAR 1990 ESTIMATES
CONSTRUCTION OF THE AUTOMATION SCIENCES RESEARCH FACILITY

PERSPECTIVE VIEW

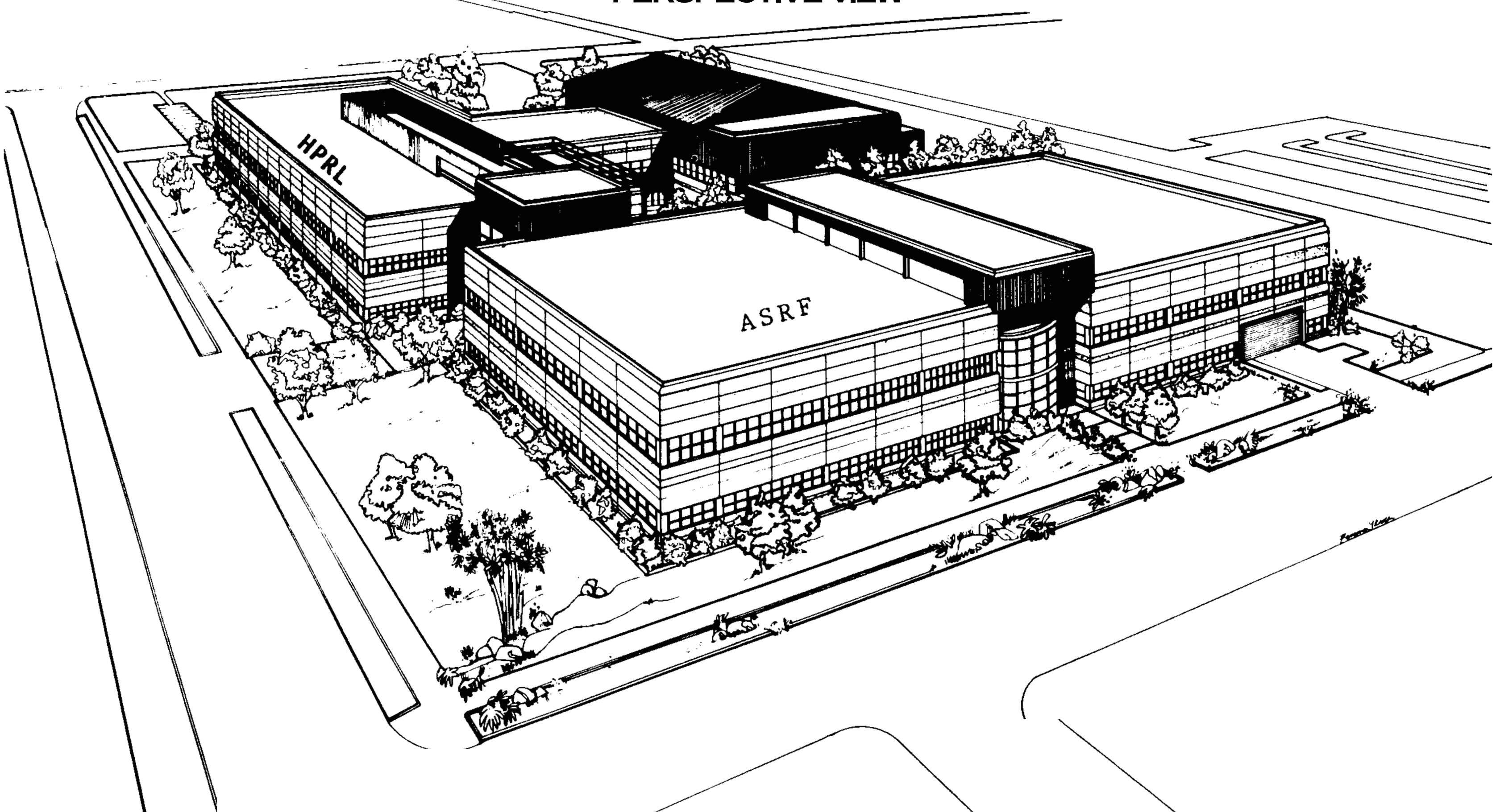


Figure 3
Figure

LANGLEY
RESEARCH CENTER

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1990 ESTIMATES

SUMMARY

LANGLEY RESEARCH CENTER

	Amount	Page No.
Office of Aeronautics and Space Technology:		
Construction of Supersonic/Hypersonic Low Disturbance Tunnel	[illegible],900,000	CF 9 1

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1990 ESTIMATES

PROJECT TITLE: Construction p

INSTALLATION: Langley Rese e

FY 1990 CoF Estimate:

LOCATION OF PROJECT: Hampton, Virginia

COGNIZANT HEADQUARTERS OFFICE: Office of Aeronautics and Space Technology

FY 1989 AND PRIOR YEARS' FUNDING: The following prior years' funding is related to this project:

	Planning and Design	Construction	Total
Specific CoF Funding........................	$635,954	---	$ 635,954
Capitalized Investment......................	---	$22,496,482	22,496,482
Total.............	$635,954	$22,496,482	$23,132,436

SUMMARY PURPOSE AND SCOPE:

This project will provide an aerodynamic test environment to eliminate or reduce high intensity acoustic disturbance radiated into the test section from turbulent boundary layers on nozzle walls. These unsteady disturbances dominate boundary-layer transition from laminar to turbulent flow on test models in conventional wind tunnels and invalidate test data that is sensitive to transition phenomena. The proposed facility will eliminate these severe problems.

PROJECT JUSTIFICATION:

All existing wind tunnels operating above approximately Mach 2.5 have high acoustic disturbance levels which extend up to frequencies as high as 300 kilohertz (kHz). This noise dominates basic flow mechanisms and preclude viscous flow studies. This proposed tunnel will provide a very significant improvement in aerodynamic testing because it will provide test-section disturbance levels of 10 to 100 times less than those typical of existing tunnels. The proposed tunnel's capabilities will produce the criteria for determining data validity and quantifying disturbance related adjustments. Therefore, the proposed tunnel will eliminate testing conducted in existing wind tunnels under conditions that produce questionable or invalid results due to the dominance of acoustic disturbances.

The proposed tunnel will be similar to existing pilot tunnels, but scaled up by a factor of about three. Two very important advantages for conducting research in the proposed tunnel rather than in the pilot tunnels are that: (1) these thicker boundary layers will be more accessible for detailed probing, and (2) the thicker boundary layers will be less sensitive to "built-in" wall disturbances such as machining errors, wall waviness and roughness.

IMPACT OF DELAY:

This facility is required now to improve the design of supersonic and hypersonic flight vehicles, particularly for drag reduction and fuel economy. Quality laminar-flow control research will not be possible until this unique facility becomes operational. These capability are required for the U.S. to maintain leadership and competitiveness in future high-speed aerospace vehicle designs.

PROJECT DESCRIPTION:

The proposed facility will have a low-disturbance test core about three times larger than that of the pilot facilities. The facility will be designed in a modular fashion to allow interchangeable nozzles of Mach 3.5 and Mach 6.0 to be utilized. A new 8-foot-diameter by 25-foot-long settling chamber with flow straightening, noise attenuation, and turbulence reduction devices will be provided. The chamber is to be connected to an existing heater to be provided with a new tube bundle, and a modified and improved air supply system capable of more than the required mass flows, pressures and temperatures which are already controlled by a master computer. Transducers for pressure and temperature will be added and 1-micron particle filter system will be installed.

The new Mach 3.5 nozzle will be a two-dimensional rapid-expansion nozzle with boundary-layer bleed-off. The Mach 6.0 nozzle will be an axis-symmetric contoured nozzle approximately 3-1/2 meters long and 0.6 meter exit diameter. A new isolation valve is to be provided between the plenum and sphere. The required vacuum system with pumps and spheres already exists. The test section and model injection system will be installed to position the model in the forward test core. Also a new variable-air diffuser with an isolation valve will be connected to a second existing vacuum system. The exhaust to the atmosphere will be routed through an existing noise muffler.

PROJECT COST ESTIMATE:

Project cost estimates are based on a preliminary engineering report.

	Unit of Measure	Quantity	Unit cost	Cost
Land Acquisition	---	---	---	---
Construction	---	---	---	$6,900,000
Structural	LS	---	---	250,000
Mechanical	LS	---	---	6,364,000
Electrical	LS	---	---	286,000
Fallout Shelter (not feasible)	---	---	---	---
Total				$6,900,000

LIST OF RELATED GRAPHICS:

Figure 1 - Location Plan
Figure 2 - Sketch of Supersonic Low-Disturbance Tunnel

OTHER EQUIPMENT SUMMARY:

None

FUTURE CoF FUNDING REQUIRED TO COMPLETE THIS PROJECT:

At the present time there are no requirements for future CoF Funding.

LANGLEY RESEARCH CENTER
FISCAL YEAR 1990 ESTIMATE
CONSTRUCTION OF SUPERSONIC/HYPERSONIC LOW-DISTURBANCE TUNNEL

LOCATION PLAN

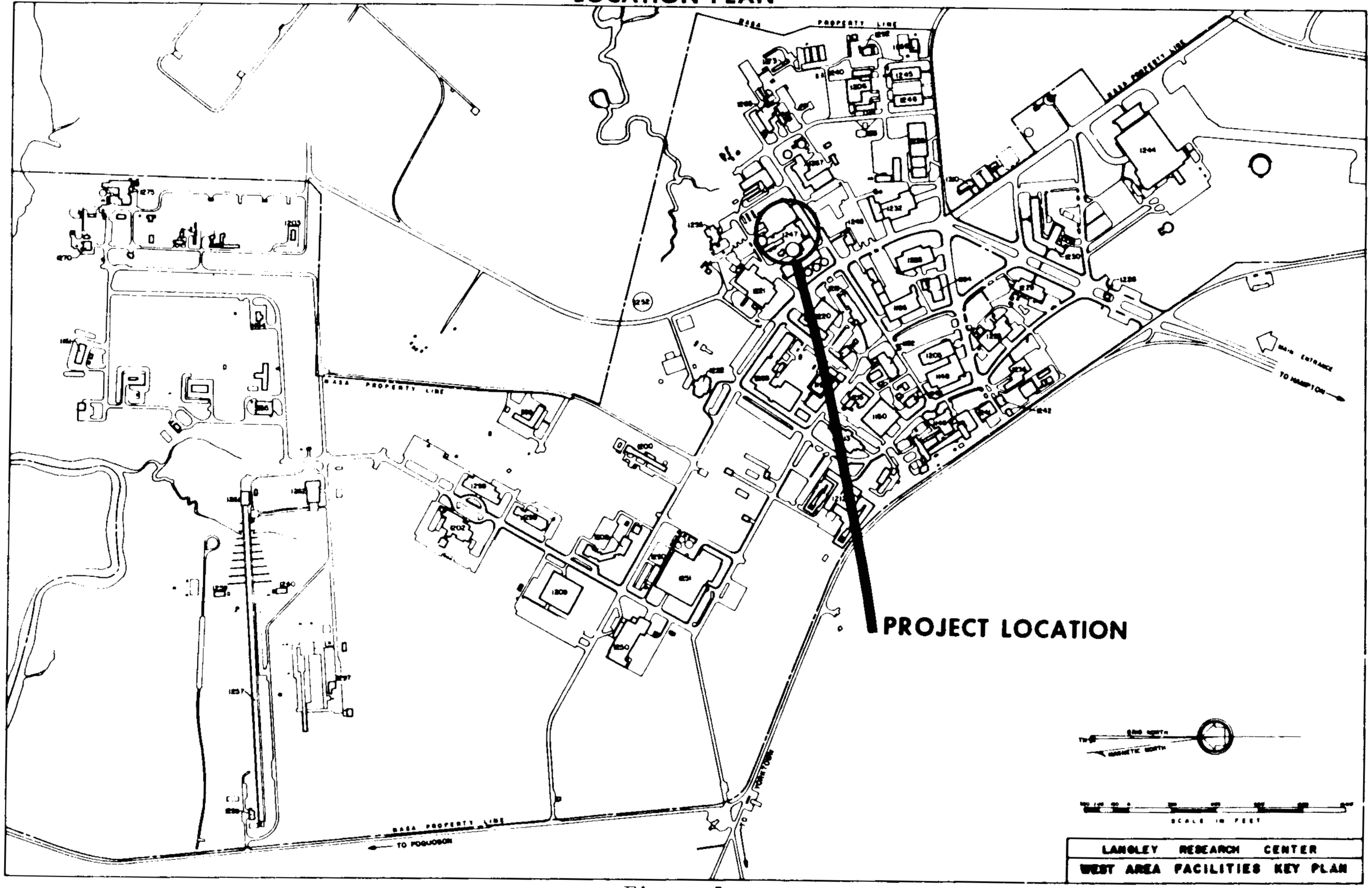


Figure 1

LANGLEY RESEARCH CENTER
FISCAL YEAR 1990 ESTIMATE
CONSTRUCTION OF SUPERSONIC/HYPERSONIC LOU-DISTURBANCE TUNNEL
SKETCH OF PROPOSED TUNNEL

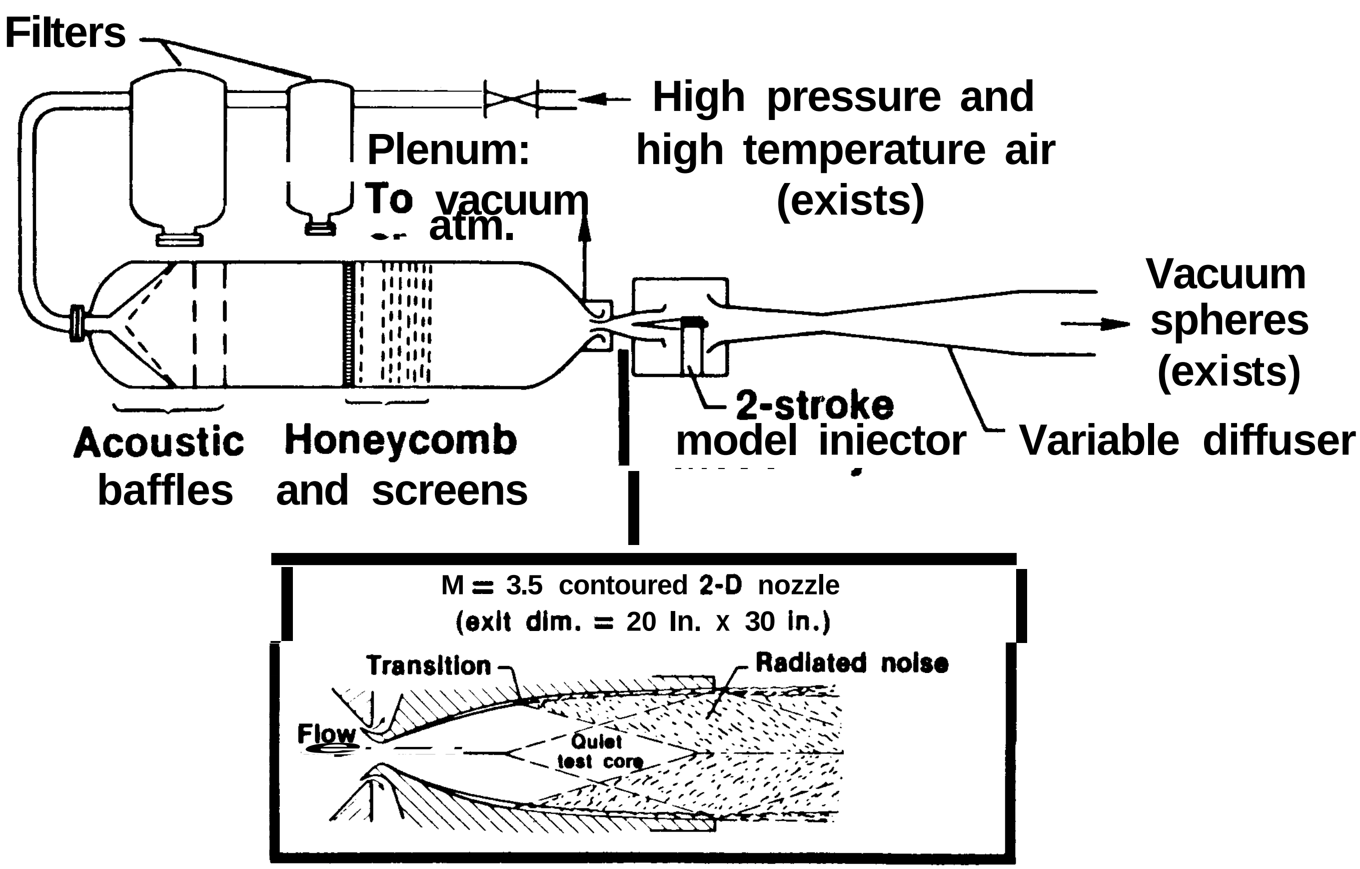


Figure 2

VARIOUS LOCATIONS

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1990 ESTIMATES

SUMMARY

VARIOUS LOCATIONS

	Amount	Page No.
Office of Space Operations:		
Modifications for Seismic Safety, Goldstone, CA..................	2,600,000	CF 10 1

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1990 ESTIMATES

PROJECT TITLE: Modif S

INSTALLATION: Jet P o

FY 1990 CoF Estimate:

LOCATION OF PROJECT: Goldstone, California

COGNIZANT HEADQUARTERS OFFICE: Office of Space Operations

FY 1989 AND PRIOR YEARS' FUNDING: The following prior years' funding is related to this project:

	Planning and Design	Construction	Total
Specific CoF Funding..........................	251,500	2,517 240	$2,768,740
Capitalized Investment..........................	---	---	---
Total	$251,500	$2,517,240	$2,768,740

SUMMARY PURPOSE AND SCOPE:

This project provides for the modifications to various buildings at the Goldstone Deep Space Communications Complex (GDSCC), California, to enhance seismic safety of Deep Space Network (DSN) operations. Modifications include the structural strengthening of the buildings and bracing of associated mechanical and electrical equipment. Some functions and personnel will be relocated to other buildings in order to provide for a safer seismic environment.

PROJECT JUSTIFICATION:

The Goldstone Deep Space Communications Complex (GDSCC) is located in the Mojave Desert in an area identified in the Uniform Building Code as Seismic Zone IV, which is the highest risk classification. These operations critical buildings were designed and constructed prior to the latest design code when the Goldstone area had the lower risk classification of Zone 111. Substantially increased structural strengthening of buildings and bracing and anchoring of utility and building related equipment are required to reduce hazards to personnel and vital space mission support systems.

Operations planning for GDSCC has determined that it is more economical to close the old Apollo site, Deep Space Station (DSS-16) facilities and consolidate the functions at other sites in lieu of making extensive seismic modifications at this site. Data handling functions will be relocated to the Mars site. Additional space is also needed in this facility to accommodate the electronic equipment and operations staff now temporarily located in trailers.

IMPACT OF DELAY:

Delay of this project will result in the continued risk that these GDSCC buildings and related equipment will not withstand a major earthquake. The result will be injury to personnel and the loss of vital communication, tracking and command support for operational spacecraft.

PROJECT DESCRIPTION:

This project provides modifications for seismic safety in G-24 Echo Power Plant, G-51 Venus Operations, G-60 Venus Laboratory and Offices, G-81 Mars Power Plant and Switchgear. Structural modifications to the buildings include the strengthening of shear walls with steel mesh reinforced concrete laminate and reinforcing of the roof to wall connections. Bracing and anchoring of electrical and mechanical building equipment is also included. This project also includes the construction of a 54 by 60 foot addition to the east side of Building 86 Mars Operations Control with a full height cable plenum and a computer floor system to safely accommodate equipment and operating personnel. Heating, ventilating, air-conditioning, and fire protective systems will be modified, and electrical power, lighting, grounding and communications systems will be provided.

PROJECT COST ESTIMATE:

Project cost estimate is based on preliminary engineering report.

	Unit of Measure	Quantity	Unit cost	cost
Land Acquisition	---	---	---	---
Construction	---	---	---	$2,600,000
G-24 Echo Power Plant	LS	---	---	400,000
G-51 Venus Operations	LS	---	---	300,000
G-60 Venus Laboratory and Office	LS	---	---	250,000
G-81 Mars Power Plant and Switchgear	LS	---	---	400,000
G-86 Mars Operations Control				1,250,000
Architectural/Structual	LS	---	---	(600,000)
Mechanical	LS	---	---	(500,000)
Electrical	LS	---	---	(150,000)
Equipment	---	---	---	---
Fallout Shelter (not feasible)	---	---	---	---
Total				$2,600,000

LIST OF RELATED GRAPHICS:

Figure 1 - Location Plan
Figure 2 - G-81 Mars Power Plant
Figure 3 - Plot Plan Building G-86 Addition

OTHER EQUIPMENT SUMMARY:

Computers and other electronic data processing equipment valued at approximately $13,000,000 will be relocated from the Apollo site and trailers to Building 86.

FUTURE CoF FUNDING REQUIRED TO COMPLETE THIS PROJECT:

No additional CoF funds are required to complete this project.

MODIFICATIONS FOR SEISMIC SAFETY, GOLDSTONE, CALIFORNIA

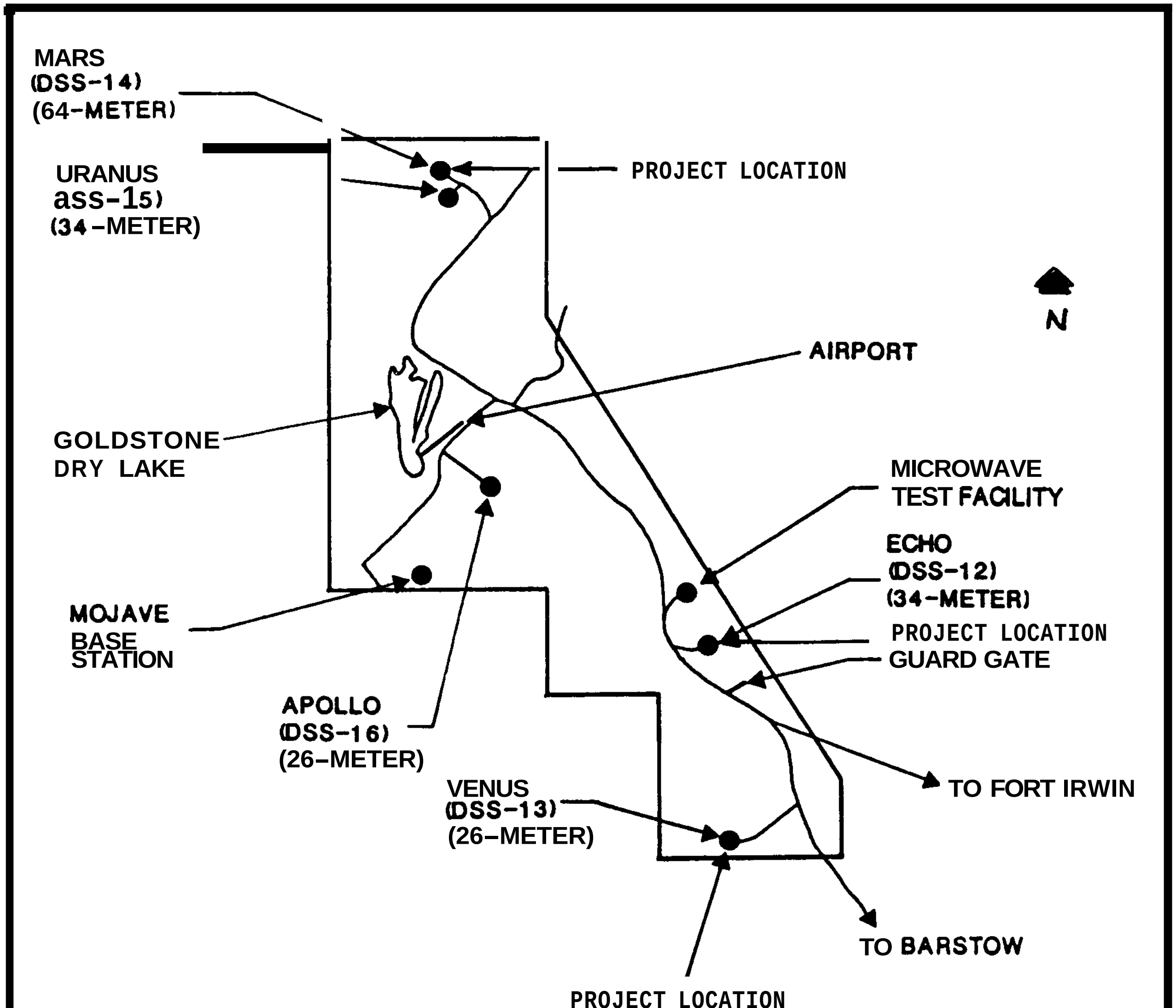
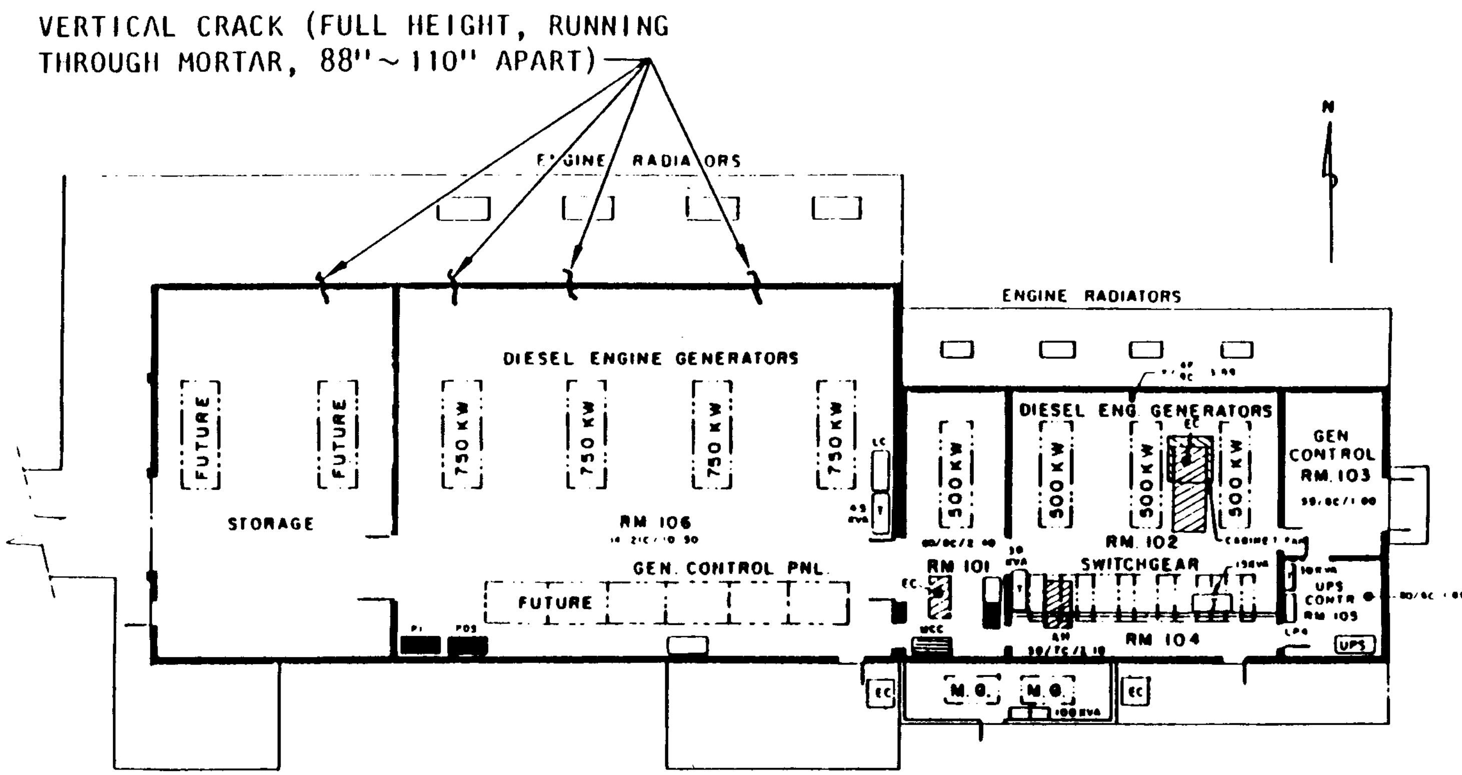


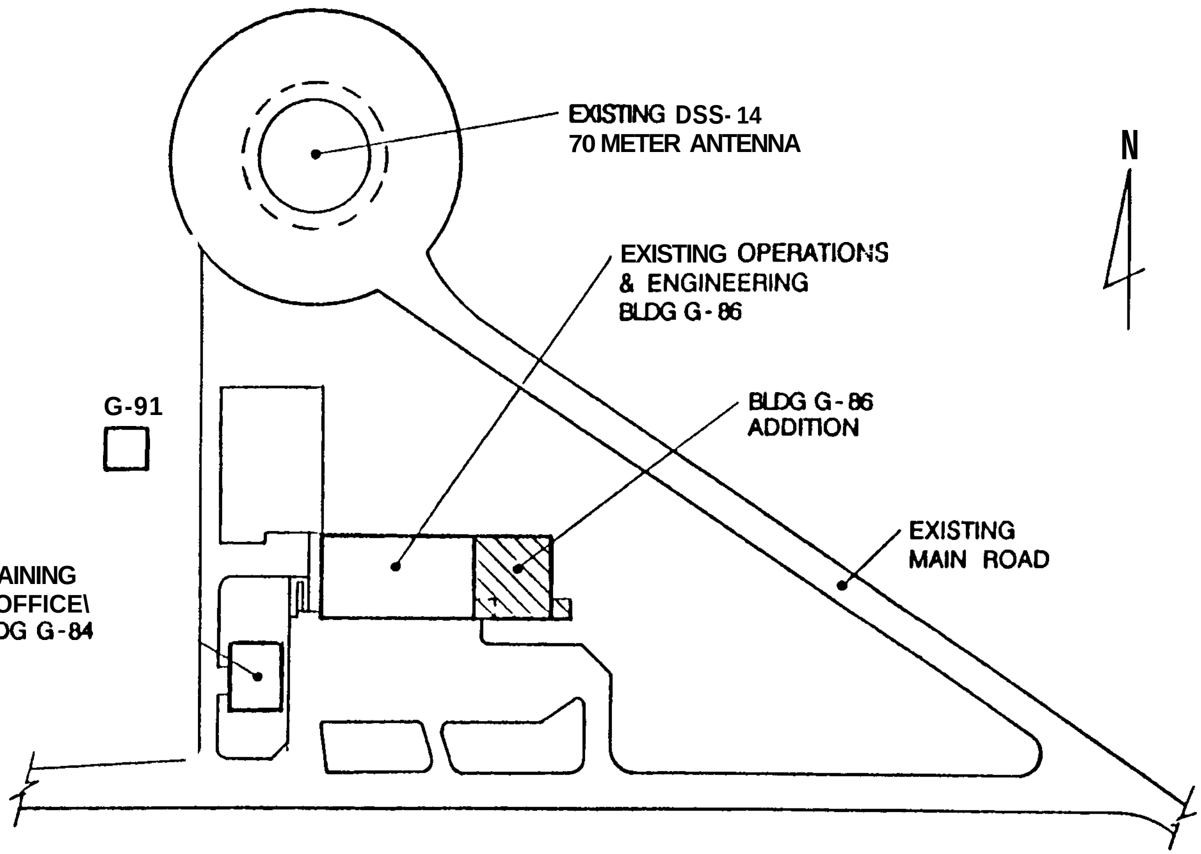
FIGURE 1

VARIOUS LOCATIONS
FISCAL YEAR 1990 ESTIMATES
MODIFICATIONS FOR SEISMIC SAFETY, GOLDSTONE, CALIFORNIA



G-81 MARS POWER PLANT

FIGURE 2



PLOT PLAN BUILDING 86 ADDITION

FIGURE 3

REPAIR

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1990 ESTIMATES

SUMMARY

REPAIR

Summary of Project Amounts by Location:

	Amount	Page No.
Ames Research Center	$ 3.080. 000	CF 11-3
Goddard Space Flight Center	1.655. 000	CF 11-4
Jet Propulsion Laboratory	1.920. 000	CF 11-5
Johnson Space Center	2.670. 000	CF 11-6
Kennedy Space Center	3,375,000	CF 11-8
Langley Research Center	3.405. 000	CF 11-10
Lewis Research Center	3.110. 000	CF 11-11
Marshall Space Flight Center	1.650. 000	CF 11-12
Michoud Assembly Facility	2.610. 000	CF 11-13
Stennis Space Center	975,000	CF 11-14
Wallops Flight Facility	2,110,000	CF 11-14
Miscellaneous Projects Not in Excess of $150,000 Each	1.440. 000	CF 11-15
Total	$28.000. 000	

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1990 ESTIMATES

PROJECT TITLE: Repair of Facilities, Not in Excess Of $750,000 Per Project

INSTALLATION: Various Locations

FY 1990 CoF ESTIMATE: $28,000,000

FY 1988: $24,400,000   FY 1989: 924,900,000

COGNIZANT INSTALLATIONS/LOCATIONS OF PROJECT: Various Locations

COGNIZANT HEADQUARTERS OFFICE: Office of Management

SUMMARY PURPOSE AND SCOPE:

These resources will provide for large repairs to facilities at NASA field installations and Government-owned industrial plants supporting NASA activities. Included in the request are those facility repair needs for FY 1990 that can be predicted at the time of the submission of these estimates and are not to exceed $750,000 per project. The thrust of this program is to restore facilities and components thereof, including collateral equipment, to a condition substantially equivalent to their originally intended and designed capability. The request includes the substantially equivalent replacement of utility systems and collateral equipment necessitated by incipient or actual breakdown. This work also includes major preventive measures which are normally accomplished on a cyclic schedule of greater than one year.

PROJECT JUSTIFICATION:

A major portion of the agency's facilities exceeds 25 years in age, and increases in repair requirements are to be expected. Maintenance and repair costs for mechanical and electrical systems in a typical building are almost three times higher during the 16- to 30-year period of a building's life than they are during the initial 15 years. Many electrical and mechanical components reach the end of their serviceable or economic life at about the 15 to 20 year point and should be replaced in the interest of long-term economy. Continued piecemeal repair of these components is usually more costly in the long run than replacement at the end of the economic life of the original components. Approximately 75 percent of NASA's physical plant is in the 16- to 30-year old category.

A major thrust of this repair program is to help preserve the capabilities of the agency's $4.0 billion physical plant. An analysis of each project clearly indicates that this work must be addressed and progressively accomplished. Otherwise, risks are increased and future repair costs will be significantly greater. More importantly, there will be increased breakdowns, interruption of critical operations and costly unscheduled repairs incurred.

This program includes only facility repair work having an estimated cost not in excess of $750,000 per project. The work is of such a nature and magnitude that it cannot be accomplished by routine day-to-day facility maintenance and repair activities. Repair projects estimated to cost more than $750,000, are included as separate discrete projects in the budget request.

PROJECT DESCRIPTION:

Proposed repair projects for FY 1990 totaling $28,000,000 are described under "PROJECT COST ESTIMATE." Projects estimated to cost not in excess of $150,000 have not been individually described or identified by Center. The total request for this category is $1,440,000. This repair program has been distilled from requests of approximately $49,000,000, and thus represents a modest request in relation to the continuing backlog of this type of work. Based on relative urgency and expected return on investment, the projects which comprise this request are of the highest priority. Deferral of this mission-essential work would adversely affect the availability of critical facilities and program schedules.

During the course of the year, it is recognized that some rearrangement of priority may be necessary. This may force a change in some of the items to be accomplished. Any such change, however, will be accomplished within total available repair resources. The following broad categories of work are described further in the "PROJECT COST ESTIMATE":

a. Utility Systems $9,100,000

b. General Purpose Buildings 3,700,000

c. Technical Buildings/Structures 6,000,000

d. Pavements and Drainage 2,200,000

e. Building Exteriors and Roofs.. 7,000,000

PROJECT COST ESTIMATE:

A. Ames Research Center (ARC) $3,080,000

1. Repair of Pressure Systems, Various Locations 740,000

This project provides for the repair and recertification of various high-pressure system components found to be defective by the pressure vessel recertification program. Specifically, the project provides for the following repairs: (a) 3.5-foot (ft.) Hypersonic Wind Tunnel (HWT) Auxiliary Building, N229A 3000 pounds per square inch (psi) air isolation valves; (b) Experimental Fluid Dynamics Facility, N229 3000 psi 8" control valve, and components of the vacuum system; and (c) Fluid Dynamics Laboratory, N231 replacement of the 8" control valve for High Reynolds control.

2. Repair Roofs, N-227 and N-229 460,000

This project provides for complete repair of the roofs of buildings, Unitary Plan Wind Tunnel (WT) Building, N227 and the Experimental Fluid Dynamic Facility, N-229. The existing roofs are over 25 years old and require extensive maintenance each year to correct progressive membrane failures. Work will include new insulation, membranes, flashings and drains.

3. Replace Power Transformer (T-49).. 740,000

This project will remove and replace the existing 40-year old 11/6.9kV transformer (T-49) and switch gear with a new 10 megavoltamp (mVA), 110/12.8-6.9 kilovoltamp (kVA) dual voltage system. Additionally, a new 15,000 volt capacitor will be installed for power factor correction. The existing transformer is currently 25 percent overloaded and must be cooled with water to maintain safe structual temperatures. Safety and reliability are currently jeopardized. Failure of this system would have significant impact on the center's programmatic support capability.

4. Repair of the 7x10-Foot Wind Tunnel, No.1 (N-215).................................... 740,000

This project provides for structural repair of the 7x10-Ft WT #1, N-215, including a new roof drainage protection cover to improve water drainage off the structure. The existing structure has been significantly degraded due to severe corrosion. Numerous patches have been added to both the top and sides where rust has eaten completely through the steel. Without major repair the tunnel roof will degrade further thus increasing the hazard to personnel and model'damage from pooling water.

5. Repair of the 14-FT Transonic Wind Tunnel (N-218)..................................... 400,000

This project provides for the replacement of the compressor protection screen and replacement of the diffuser to improve wind tunnel flow quality. The existing protection screen was destroyed due to high dynamic loads caused by separation of flow in the tunnel. The new diffuser will correct this flow problem and the new screen is necessary to protect the compressor blades from loose debris or model parts that might come apart during tunnel operation.

B. <u>Goddard Space Flight Center</u> (GSFC).. <u>$1,655,000</u>

1. Replace Steam Lines, Various Locations...... 400,000

This project will provide replacement of approximately 1,000 linear feet of steam and condensate piping between Manhole 14A and 14B. Also included will be the installation of approximately 1,200 linear feet of high pressure returns between Manhole 3 to the Applied Sciences Laboratory (11) and Manhole 14C to the Space Science Data Center Building 26. The existing system was installed in the early 1960's and has had major condensate leaks. The steel housing is severely corroded. High pressure returns are required to provide protection to the condensate system. This project will help minimize capacity losses, reduce maintenance costs and restore reliability.

2. Repair Roofs, Buildings 15 and 26 550,000

This project provides for the replacement of roofs for the administrative wing of the Launch Phase Simulator, Building 15, and the Space Science Data Center, Building 26. Total roof area is approximately 50,000 square feet (sq. ft.). Coping, flashing, gravel stops and other accessories will also be replaced. Walkways will be provided and ponding problems will be corrected. The existing roofs are between 10 and 25 years old and contain numerous patches and temporary repairs. Proposed work will restore facility integrity and minimize potential loss due to water damage.

3. Repairs of Electrical Systems, Buildings 1 and 19 705,000

This project provides for the repair and upgrading of the electrical systems a follows: 1) the Space Projects Building 1 requires the replacement of a 500 kVA, 4160V/480V, transformer by a 13,800V/480V, transformer, primary switch, secondary and tie breaker, and the power hook-up to feeder 5 and associated load center. 2) the Technical Support Building 19 requires replacement of the present single-ended and obsolete substation with two 500 kVA transformers, primary switches, and secondary and tie breakers. The switches and transformers will be rated 4.16 kV/13.2 kV to accommodate the Center's future distribution system upgrade. The construction of a 800 sq. ft. electrical equipment room to accommodate the new equipment is also included. This equipment has reached end-of-service life and requires replacement to improve electrical system reliability for mission-critical operations.

C. Jet Propulsion Laboratory (JPL) $1,920,000

1. Replace Ceilings and Lighting System (183) 710,000

This project will replace the existing acoustic tile ceilings and lighting fixtures on four floors of the Physical Sciences Laboratory, Building 183. This will require the removal and replacement of all lighting fixtures and approximately 50,000 sq. ft. of ceiling tiles and ceiling support systems on four floors. The existing ceiling acoustical tiles were installed when the building was constructed in 1965. The ceiling tile system is aging, obsolete and becoming brittle which makes it very difficult to remove to gain ceiling plenum access. The lighting system needs replacement with fixtures that produce better light distribution and are more economical to operate and easier to service.

2. Replace Administration Building Lighting Systems (180).................................. 500,000

This project provides for the replacement of all surface-mounted light fixtures in Administration Building 180 with new fluorescent light fixtures. The asbestos fireproofing on the underside of the deck above the ceiling will be removed and replaced with non-asbestos fireproofing. There are presently 1,038 fixtures serving 46,000 net sq. ft. of office space. Most of the light fixtures have been in service since the building was constructed in 1964. The lenses have deteriorated, reducing the effective light levels, and the fiberglass insulation on the internal wiring in the fixture is deteriorating.

3. Replace HVAC System, Physical Sciences Laboratory (183)................................. 710,000

This project provides for the replacement of approximately 25 deteriorating (rusting and leaking) air handlers on four floors of the Physical Sciences Laboratory, Building 183. This project will also replace the existing steam boiler and corroded piping with a hot water boiler system and properly sized piping. Control devices will be modernized for more economical control of the building air-conditioning systems. Extensive maintenance of the existing system is no longer economical. Replacement is required. The new air handlers will supply the floors with a modern and properly operating system. The existing steam piping system is badly corroded and the boilers are 30 years old, in poor condition and in need of replacement.

D. Johnson Space Center (JSC)... $2,670,000

1. Repair of B-Power Switchgear (48).. 700,000

This project provides for repair of the B-power 480-volt switchgear in the Emergency Power Building, No. 48 and the replacement of 4,000-ampere bus duct, 24 branch circuit breakers, two 4,000-ampere tie circuit breakers, current and potential transformers for buses B-1 and B-2, and all generator control circuits in the B-1 and B-2 switchgear. This switchgear has been in service since 1963 and is obsolete and unreliable. Many of the component parts are worn and replacements are no longer available. The new switchgear will be used to provide electrical power to mission-critical computer equipment in the Mission Control Center. Failure of this switchgear during a mission could seriously jeopardize mission safety. When complete, this project will ensure the reliability of emergency power which supports the Mission Control Center.

2. Repair Electrical Substations 12, 32, and 35 570,000

This project provides for the repair of the high-voltage switching provisions, secondary breakers and interconnecting primary conductor at Central Data Office, Building 12, Space Environment Simulation Laboratory, Building 32 and Mission Simulation Development Facility, Building 35. This project includes replacement of 15-kV switches, two 750-kVA power transformers and indoor 480-V switchgear in Building 35 with an outdoor 1,000-kVA power transformer and an indoor 3,000-kVA transformer and outdoor switchgear. Two transformers in Building 32 will be replaced and the indoor power panels in Building 12 will be replaced with new switchgear with draw-out breakers and new power panels. Existing electrical equipment is deteriorating (leaking transformers, obsolete air-type switches with corrosion of contacts and contaminated insulation). If this equipment is not repaired, system reliability will degrade to the point where critical programs will be adversely affected. This project will provide increased reliability and safety.

3. Repair Flight Operations Facilities, Ellington Field 550,000

This project provides for repair of NASA's aircraft operations facilities located at Ellington Field, Houston, Texas. The work will include the following: replacement of approximately 2,000 square yards of mooring apron, connection of the fire suppression water-line in Aircraft Corrosion Control Facility Building 136 and Aircraft Tire and Wheel Maintenance Shop, Building 137, and connection of natural gas line to the existing gas-fired boiler in the mechanical room of Building 135. Work also includes replacing the electrical panel, feeder cables and circuit breaker at Buildings 135 and 276. Additionally, the existing platform-mounted transformer at Building 990 will be replaced with a new pad-mounted transformer. These facilities have deteriorated beyond economical maintenance of the support systems. This project will repair the main hangars used for servicing various program support aircraft including T-38 jet and Shuttle training aircraft.

4. Replace High Voltage Switches, NASA Industrial Plant, Downey, California. 450,000

This project provides for the replacement of 22 exterior and 10 interior 12,000-V, 600-ampere electrical transfer switches. The switches will be replaced with air-type automatic transfer switches of the same approximate capacity. The switches provide electrical power distribution for the Downey complex and are located throughout the site. The primary electrical power switches slated for replacement have been in service over 20 years and have deteriorated due to age and exposure to smog and various other atmospheric conditions. The switch contacts are heavily pitted and the support insulation is contaminated, These conditions have resulted in a number of major power outages at the Downey complex in recent years. Replacement of the switches will provide increased reliability for Shuttle and other future program production schedules.

5. Repair 15-kV Power Cable, Utility Tunnel System 400,000

This project will replace electrical power feeders 2-5 and 2-9 in the utility tunnel system. The work includes the replacement of approximately 5,500 linear feet of 15-kV armored, aluminum cable, servicing Buildings 24, 30, 44, 45, 47, and 48. The replacement will be 15-kV aluminum armored copper cable. The existing aluminum conductor polyethylene-insulated cable in the Center's electrical distribution system has been in continuous operation for more than 24 years. Life expectancy of this type of cable in the Gulf Coast environment is approximately 20 years. Recently, several unscheduled outages have occurred because of faults in the cable system. If the tunnel system were to flood, serious cable failure would occur. The new cable will be impervious to water and will assure reliable electrical power for the Center's critical facilities.

E. <u>Kennedy Space Center</u> (KSC) .... <u>$3,375,000</u>

1. Repair Roofs, Operations and Checkout (O&C) Building 595,000

This project will replace approximately 56,000 sq. ft. of roofing on the O&C Building M7-0355. Normal maintenance will not be adequate to prevent leaking through this section of the roof, and water could cause damage to flight hardware and ground support equipment. This facility is the primary payload assembly and checkout facility for horizontally processed payloads such as Spacelab.

2. Replace Chiller and Control Systems, KSC Headquarters Building 505,000

The project provides for the removal and replacement of a 520-ton chiller and controls in the KSC Headquarters Building M6-0399. The project also includes the replacement of heating, ventilating and air conditioning (HVAC) controller system for three chillers with a programmable logic controller (PLC) system. The existing carrier chiller unit requires excessive maintenance to keep it in service. Frequent breakdowns due to aging of components have degraded the reliability of the unit to an unacceptable level. Also, the existing HVAC control system is worn out and requires extensive maintenance. Replacement with a PLC system would reduce maintenance and provide better system control for energy management.

3. Repair Saturn Causeway - Vehicle Assembly Building (VAB) to Pad A...................... 470,000

The project will repair about 4.1 miles of two-lane road from the Vehicle Assembly Building (VAB) to Pad A. Approximately 1,730 tons of asphaltic concrete will be used for a leveling course due to settling of the road bed. A one-inch asphaltic concrete overlay will be applied to some 57,750 square yards of pavement along with approximately 64,950 linear feet of striping. This road is subjected to heavy employee traffic as well as Shuttle-related cargo and support equipment. Cracking permits moisture to enter and undermine the road base thus deteriorating the base and wearing course.

4. Repair Rest Rooms, VAB High Bay 300,000

This project provides for renovating worn out rest rooms on floors 1 through 10, Towers B and E, and floor 3 in C Tower in the VAB High Bay. The work involves installation of drop ceilings, tile floors, partitions, exhaust fans and fluorescent lights. The drop ceiling and fluorescent lighting will conserve electrical energy. The new vinyl floors, walls and exhaust fans will improve sanitary conditions and make maintenance easier.

5. Replace Built-up Roof System, KSC Headquarters Building 285,000

This project will replace approximately 37,000 sq. ft. of deteriorated roofing with new conventional 5-ply built-up roofing on a portion of the Headquarters Building. This portion of the roof was rehabilitated in 1977. Failure to provide repair will result in damage to ceilings, walls and equipment in this building. Periodic roof maintenance has been performed, but replacement of the roof is now necessary.

6. Replace High Temperature Hot Water Piping, Industrial Area............................. 735,000

This project provides for the replacement of approximately 2,440 linear feet of high temperature hot water underground piping in the Industrial Area. The buildings being serviced by this piping include M6-698, M7-961, M7-1061, M7-1210, M7-1410, M7-1412, M6-688, M7-409 and M7-409A. The existing buried building feeder pipes are continuing to deteriorate and fail due to degradation of insulation and piping caused by groundwater. As these failures occur, payload flows and Shuttle operations are adversely affected.

7. Repair Roof, Base Support Facility (M6-0486).. 485,000

This project will replace approximately 74,000 sq. ft. of built-up roofing on the Base Support Facility Building M6-0486. The project also includes the installation of insulation, new flashing and gutter/downspouts. The existing roof system has outlived its design life and has deteriorated to a point that extensive periodic repair is required to bring the roof to reliable integrity. The facility houses ground support equipment (GSE) which will be damaged by water intrusion.

F. Langley Research Center (LaRC) $3,405,000

1. Repairs to the Tunnel Shell, Unitary Wind Tunnel (1251) 700,000

This project provides for repairs to approximately 300 linear feet of defective welds in the Unitary Wind Tunnel shell, Building 1251. The work includes removal of asbestos insulation, removal of unacceptable weld metal, rewelding the tunnel shell, post-weld, treatment and radiographic inspection of the new welds. Repair of unacceptable welds is essential. These repairs must be completed in order to ensure safe and efficient operation of this critical research facility.

2. Repairs to High Pressure Systems, Various Facilities 600,000

This project provides for repairs to high pressure gas and hydraulic systems that have been found defective during recertification. The work includes the replacement of defective welds, piping, valves and fittings and the radiographic inspection of the repaired welds. Work will be accomplished in the Systems Engineering Division Laboratory, Building 1283, the Structures Laboratory, Building 1148, the 0.3-Meter Transonic Cryogenic Tunnel, Building 1242, the Ceramic Heated Combustion Facility, Building 1263, the Materials Processing and Development Shop, Building 1267A and a portion of the pressure shell of the Low-Turbulence Pressure Tunnel, Building 582A. Completion of this project is essential to ensure the safe and efficient operation of these research facilities.

3. Repairs to Warner Substation (1239) 715,000

This project provides for the replacement of the 2300 Volt "K" switchgear and weatherproof battery enclosure at Warner Road Substation, Building 1239. Work includes removal of existing switchgear, disconnecting cables from existing loads on the "K" switchgear, installation of new switchgear and reconnecting cables. The switchgear serves four major research facilities. It has become unreliable and spare parts are no longer manufactured. The replacement of the switchgear is necessary to ensure a dependable power source.

4. Replace Roof Unitary Complex (1251 and 1251A) 730,000

This project provides for replacement of approximately 79,000 sq. ft. of roofing on the Unitary Wind Tunnel, Building 1251 and 31-inch Mach 10 Tunnel, Building 1251A. The existing built-up roofing, comprised of 15 levels, will be removed and replaced with a new roofing system. The roofs have deteriorated and replacement is necessary to ensure the integrity of the facility and to prevent damage to the equipment housed in the complex.

5. Replace Roofs, Various Facilities, West Area 660,000

This project provides for the replacement of approximately 71,565 sq. ft. of existing built-up roofing on three buildings in the West Area. This includes the Advanced Technology Research Laboratory, Building 1200; Hypersonic Propulsion Facility, Building 1221 and the 16-ft. Transonic Tunnel, Building 1146. The roofs have deteriorated and replacement is necessary to ensure the integrity of the facilities. Spot repairs are no longer feasible or economical.

G. Lewis Research Center (LeRC) $3,110,000

1. Repair Exhaust System, Cell 3, Propulsion Systems Laboratory (PSL) (125) 600,000

This project provides repairs to Cell 3 exhaust system in the PSL, Building 125. Work includes repair of the exhaust bulkhead and water cooled collector, installation of new seals on the section collector and fabrication and installation of various sized collector spool pieces and adaptors. The cell has been in operation for 18 years with no major repairs to the engine exhaust systems. The operating environment has resulted in deterioration of the systems. Future deflected thrust engines will impose more severe operating environments on the collectors and bulkhead and repair is mandatory.

2. Repair Exterior and Roofs, Space Power Facility (1411) 485,000

This project provides for repair of exterior walls and roofs at the Space Power Facility, (SPF) Building 1411. Work includes cleaning, repairing, and waterproofing exterior building membranes, spalling concrete walls, and replacing flat roofs. The flat roofs have deteriorated past normal maintenance capabilities. Repairs are essential to maintain the integrity of the building structures.

3. Repair Heating System, Materials and Structures (49) 680,000

This project provides for repairs to the heating system in the Materials and Structures Laboratories, Building 49. The work includes removal of existing air handling units and installation of new units, removal of existing refrigeration cooling system and installation of pumps and piping into chilled water system from outside the building and installation of backflow preventers and potable water piping. The building was constructed in 1949 and the air handling equipment for heating, ventilating and air-conditioning (A/C) has never been replaced. Maintenance is increasingly difficult due to equipment age and limited parts availability.

4. Repair Shop Mechanical Systems, EPL (301) 680,000

This project provides for repair to the shop mechanical systems in the Electric Power Laboratory, Building 301. Work includes replacement of heating and ventilating units, piping, exhaust fans and air-conditioning units. Additionally, a women's restroom will be installed and corrections made to the plumbing to meet code requirements for sewer and water. The shop area was built in 1961 and conditions have deteriorated requiring frequent maintenance. Replacing mechanical equipment will increase system efficiency and reduce system maintenance.

5. Repair West Area Road.... 665,000

This project provides repairs to approximately 1,000 ft. of the west area road pavement. Paving will include widening the road to 23 ft. by including curbs, drains, sidewalk and landscaping. The roadside currently consists of ditches with culverts at intersecting roads. The existing pavement is substandard 20 ft. wide pavement with narrow one foot berms and deep roadside drainage ditches adjacent to the berms. This project replaces roadside ditches with pipe and inlets, increases road width thus reducing maintenance and improving safety.

H. Marshall Space Flight Center (MSFC).. $1,650,000

1. Repair Pressure Vessels.. 740,000

This project repairs defects in approximately 17 pressure vessels identified during recertification. The work includes inspection, shipment to a repair facility, documentation of repair, testing, return and reinstallation to current codes. This project is required to ensure the structural integrity of MSFC's pressure vessels. These vessels represent large storage volumes of high-pressure gases that support test programs. Loss of this storage capacity would impact all major test programs.

2. Repair High Pressure Piping.. 645,000

This project provides for the repair of high-pressure systems including approximately 10,000 linear feet of high-purity air piping and 2,000 linear feet of gaseous nitrogen piping and respective associated components. This project continues the repair of high-pressure systems which have deteriorated through age and heavy use and do not meet present-day American National Standards Institute (ANSI) Code and NASA certification requirements. Failures and defects are being found which make it necessary to make corrective repairs at an increasing rate.

3. Repair Roads and Paved Areas 265,000

This project provides for the repair and/or resurfacing of approximately 71,000 square yards of deteriorated roads, parking areas and hardstands at MSFC. The work consists of repairing damaged base courses, application of tack coats, overlaying with asphaltic concrete and/or a seal coat, painting of parking stripes and road markings, along with minor storm drainage improvements. These roads, parking areas and hardstands have exceeded the normal paving cycle of 15 years.

I. Michoud Assembly Facility (MAF) $2,610,000

1. Repair Second Floor West End Engineering Building (102) 740,000

This project contains a complete and usable element of mechanical, electrical and architectural repairs to a specific and separable area of Engineering Building 102. Work includes replacement of transite ductwork, insulation, hangars, dampers and accessories; electrical and cabling systems; ceiling and lighting system; and components of the fire suppression system on the second floor west end of Building 102. Building 102 houses office personnel and computer hardware. The building is over 40 years old and no major interior building rehabilitations have been performed.

2. Repair First Floor West End, Administration Building (101) 600,000

This project contains a complete and usable element of mechanical, electrical and architectural repairs to a specific and separable area of Administration Building 101. Work includes replacement of the supply/return duct work, electrical distribution/cabling system, existing overhead ceiling/lighting system, rework of the overhead sprinkler and fire alarm systems to accommodate the new ceiling system, and repair of the walls and floors in the fire damaged area at Columns 11-19. Building 101 houses office personnel and computer hardware. The building is over 40 years old and no major interior building rehabilitations have been performed.

3. Repair Roof Vertical Assembly Building (110) 530,000

This project provides for replacement of the roof of critical production Vertical Assembly Building 110 housing Cells A-F. The work includes rigging an interior system for collection of potential falling debris; installation of a temporary personnel and material hoist (215-feet-high); replacement of 393 squares of built-up roofing including insulation, flashing and broken concrete deck panels; and application of a reflective protective coating. The roof has never been replaced since its installation in 1963. The latest roof inspection revealed soft spots and blisters, moisture penetration of plies, serious gravel drifts and exposed felts.

4. Repair HVAC Units Manufacturing Building (103) 740,000

This project replaces 17 60-ton packaged HVAC units serving critical production laboratory and support areas within Manufacturing Building 103. Areas served are the Clean Room, South Mezzanine, Thermal Protection System (TPS) Components, TPS Cold Storage and North Mezzanine. Work also includes repair of deteriorated insulated ductwork and rebalancing of systems. These HVAC units have never been replaced since installation (1963-1965).

J. Stennis Space Center (SSC) $975,000

1. Canal and Waterway System Repairs 560,000

This project repairs approximately 2.5 miles of canal system embankments and access roads, six corrugated metal pipe drainage culverts, approximately 500 feet of a concrete paved ditch, and approximately 4,300 sq. ft. of the discharge flume at the A-2 Test Stand. Erosion of canal banks, deterioration of concrete ditches and culverts has accelerated due to the increased propellant barge traffic on the canals. The increased frequency of test firings at the A-2 test stand has greatly accelerated the erosion of the subbase beneath the concrete discharge flume and is increasing the possibility of collapse of flume sections into the canal. If these items are not corrected, certain sections of the canals will become unnavigable.

2. Repair Roofs, Various Buildings 415,000

This project provides for the replacement of 100.000 sq. ft. of roofing on the Administration Building, Building 1100, Environmental Laboratory, Building 1105 and the Repair and Fabrication Shop, Building 2201. Work includes removal of existing roofing and installation of new 5-ply "built-up" roofing systems. The age of these roofs is over 20 years and failure to repair will result in accelerated deterioration producing roof leaks and potential damage to expensive electronic and laboratory equipment.

K. Wallops Flight Facility (WFF) $2,110,000

1. Resurface Launch Pad at National Scientific Balloon Facility 725,000

This project provides for the resurfacing of the launch pad, approximately 87,300 square yards, at the National Scientific Balloon Facility in Palestine, Texas. The work includes the placement of a tack coat and a paving fabric over the existing pavement and the application of a two-inch bituminous concrete overlay. This area is the primary launch facility critical for balloon flight operations. The surfacing will provide a more durable and smoother surface required to safely launch balloons.

2. Repair Seawall 700,000

This project provides for the repair of the Wallops Island seawall to protect the launch area 5 and associated facilities. The construction will be in front of and over the existing seawall. The project shall include all necessary excavation and fill. This work is necessary to prevent or minimize storm damage to the wall which is becoming increasingly vulnerable due to beach erosion and deterioration of the existing protection system. Launch area 5 is currently used for approximately 18 to 24 launches per year.

3. Repair Roofs, Various Buildings 685,000

This project repairs the roof areas on the: Damage Control Station Building C-15, 3,124, sq. ft.; Central Heating Building D-8, 6,138 sq. ft.; Auditorium and Post Office Building D-10, 10,400 sq. ft.; Rocket Storage Building V-80, 6,100 sq. ft.; and Technical Science Shop Building F-10, 43,500 sq. ft. These roofs are over 20 years old and are in a state of advanced deterioration. They require numerous patches and temporary repairs yearly. Proposed work will restore facility integrity and minimize potential Government property loss due to water damage.

MISCELLANEOUS PROJECTS NOT IN EXCESS OF $150,000 EACH $1,440,000

Total $28,000,000

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

An estimated $28,000,000 to $31,000,000 per year will be required for the continuation of this essential repair program.

REHABILITATION
AND MODIFICATION

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1990 ESTIMATES

SUMMARY

REHABILITATION AND MODIFICATION

Summary of Project Amounts by Location:	Amount	Page No.
Ames Research Center	$2.270.000	CF 12-3
Dryden Flight Research Facility	1.230.000	CF 12-4
Goddard Space Flight Center	3.220.000	CF 12-4
Jet Propulsion Laboratory	2.460.000	CF 12-6
Johnson Space Center	3,500,000	CF 12-7
Kennedy Space Center	3.990.000	CF 12-9
Langley Research Center	3.335.000	CF 12-10
Lewis Research Center	3,615,000	CF 12-12
Marshall Space Flight Center	3,900,000	CF 12-14
Michoud Assembly Facility	1.295.000	CF 12-15
Stennis Space Center	2.200.000	CF 12-16
Wallops Flight Facility	1.865.000	CF 12-17
Various Locations	1.400.000	CF 12-18
Miscellaneous Projects Not in Excess of $150,000 Each	1.720.000	CF 12-19
Total	$36.000.000	

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1990 ESTIMATES

PROJECT TITLE: Rehabilitation and Modification of Facilities, Not In Excess of $750,000 Per Project

INSTALLATION: Various Locations

FY 1990 CoF Estimate: $36,000,000

FY 1988: $30,972,000 FY 1989: $32,000,000

COGNIZANT INSTALLATIONS/LOCATIONS OF PROJECT: Various Locations

COGNIZANT HEADQUARTERS OFFICE: Office of Management

SUMMARY PURPOSE AND SCOPE:

These resources will provide for the rehabilitation and modification of facilities at NASA field installations and Government-owned industrial plants supporting NASA activities. Included in this request are those facility rehabilitation and modification needs for FY 1990 that have been fully identified at the time of the submission of these estimates and are estimated not to exceed $750,000 per project. The purpose of this program may include some restoration of current functional capability but also includes enhancement of the condition of a facility so that it can more effectively accomplish its designated purpose or increase its functional capability.

PROJECT JUSTIFICATION:

Based on the initial investment costs, the NASA Capital Type Property totals approximately $7.5 billion of which the physical plant comprises some $4.0 billion. A continuing program of rehabilitation and modification of these facilities is required to accomplish the following:

a. Protect the capital investment in these facilities by minimizing the cumulative effects of wear and deterioration.

b. Ensure that these facilities are continuously available and that they operate at peak efficiency.

c. Improve the capabilities and usefulness of these facilities and thereby mitigate the effects of obsolescence.

d. Provide a better and safer environment for all personnel.

This program includes only facility rehabilitation and modification work having an estimated cost not in excess of $750,000. The work is of such a nature and magnitude that it cannot be accomplished by routine day-to-day facility maintenance or by related routine facility work efforts that are provided for in other than CoF estimates.

PROJECT DESCRIPTION:

Proposed rehabilitation and modification projects for FY 1990 totaling $36,000,000 are described under "PROJECT COST ESTIMATE." The total program of $36,000,000 has been distilled from requests of approximately $57,000,000 and represents only a modest request in relation to the backlog of this type of work. Based on relative urgency and expected return on investment, the projects which comprise this request are the highest priority requirements. Deferral of this mission-essential work would adversely impact the availability of critical facilities, program schedules, and energy conservation objectives. Only those projects estimated to cost not in excess of $150,000 have not been individually described or identified by center. The total cost of these miscellaneous projects is $1,720,000.

During the course of the year, some rearrangement of priorities may be necessary. This may force a change in some of the items to be accomplished. Any such change will be accomplished within available resources. The following broad categories of work are described further in the "PROJECT COST ESTIMATE:"

a. Utility Systems $10,255,000

b. Fire Detection/Protection Systems 4,305,000

c. General Purpose Buildings 9,945,000

d. Technical Buildings/Structures 10,900,000

e. Pavements and Drainage 595,000

PROJECT COST ESTIMATE:

A. Ames Research Center (ARC) $2,270,000

1. Rehabilitation of Cafeteria Kitchen (N-235) 600,000

This project provides for the rehabilitation of the existing 23-year-old kitchen area of N-235. Numerous violations of State and Federal health, safety and fire codes relating to the preparation and serving of food have been cited. The work will consist of a reconfiguration of the kitchen layout including new hardware, equipment, and fixtures, modifications to the serving areas, new walk-in refrigerator/freezer and modifications to the existing air-conditioning system and fire suppression system.

2. Modifications to the Telecommunications Gateway Facility (N-254) 600,000

This project provides for modifications to the telecommunications gateway facility to provide a back-up air-conditioning system for electronic equipment, installation of a new emergency power generator, an automated control system for both backup systems, reconfiguration of approximately 2,000 square feet (sq. ft.) of floor space on both the first and second floors and various safety-related modifications. This building is the main communication gateway facility for the west coast NASA communications system. These modifications will provide the required facility backup support and environmental control not currently existing and will provide for a more efficient use of existing space.

3. Modification to the High-pressure Air System (N-231) 470,000

This project provides for the installation of a new 12-inch diameter 3,000 pounds per square inch (psi) high mass flow bypass line between the existing high-pressure air storage facility and the existing 10-inch line serving building N-231. This line will prevent the rapid loss of pressure currently being experienced on the distribution system by the low mass flow rate users such as the Unitary Plan Wind Tunnel. This new line will provide a parallel flow path when required to permit undisturbed simultaneous operation by both types of service users.

4. Rehabilitation of Building N-219 600,000

This project provides for the rehabilitation of approximately 6,000 sq. ft. of the first floor of N-219 into four large open office areas, a new technical library, and several general support areas. These changes are necessary to allow consolidation of the Army Aviation Research and Technology Activity (ARTA) personnel into one building thus freeing space in N-206 and N-218 for use by NASA. By joint agreement, NASA has the responsibility to house the Army ARTA Headquarters personnel.

B. Dryden Flight Research Facility (DFRF) $1,230,000

1. Modifications for Facility Safety, Aircraft Hangars 490,000

This project provides for the installation of a new hangar integrated optical flame detector and alarm annunciation system for hangars 4801, 4802, 4826 and 4832. This system is required to bring the hangars into compliance with the NASA safety standards of NHB 1700.1. To be provided are new sensors, wiring, and annunciator panels.

2. Rehabilitation of the HVAC, Building 4800, Area A...................................... 740,000

This project provides for the complete replacement of the existing heating, ventilating, and air-conditioning (HVAC) system with a new variable air volume system in 22,000 square feet of Building 4800, Area A. Existing air handlers, ductwork, and controls will be replaced. The existing system is 23 years old and can no longer be maintained in a satisfactory working condition. All existing ductwork and air diffusion devices including air handlers will be replaced with dual duct variable air volume equipment and controls.

C. Goddard Space Flight Center (GSFC) $3,220,000

1. Rehabilitation and Modification of Electrical Systems, Buildings 3/14 730,000

This project provides for the rehabilitation and modification of the 28-year-old electrical systems in the Central Flight Control and Range Operations Building (3) and the Spacecraft Operations Facility (14). Proposed work includes the replacement of 120/208 volt branch circuit fused switches with circuit breakers, and the installation of four three-pole, 200 amp spare branch circuit-breakers in each of the following Load Centers: A6-14-4 (L2-14), B7-14-3 (P2-14), and A7-3C-5 (L2-3C); b) the addition of two 1,500 KVA, 4160V/208V transformers, and a 4,000 amp double ended load center to Building 14. Primary switches, secondary main breakers, automatic tie breaker, cabling and other ancillary items are provided. Modification of 1,000 sq. ft. of an area to accommodate the new electrical equipment is also included.

2. Modifications for Automated Data Processing Equipment, Various Buildings 650,000

This project provides for the modification of 27,000 sq. ft. of space in the Technical Processing Facility, Building 28, and 14,000 square feet in the Space Projects, Building 1, to accommodate the relocated Science Computing Center and various training and development facilities. In addition, 32,000 sq. ft. in the Space and Terrestrial Applications Facility Building 22, and 12,000 sq. ft. in the Logistics and Supply Facility, Building 16W will be modified to accommodate Guest Investigator Facilities, storage facilities and relocated laboratories and offices. This project is a part of a long-range housing plan to accommodate the Space and Earth Sciences Directorate's Automated Data Processing Equipment (ADPE) operations into existing space without constructing new facilities.

3. Modifications to Environmental Test Laboratory (10).................................... 410,000

This project provides for the modifications to the heating, ventilating and air conditioning (HVAC) system serving the basement floor of the Environmental Testing Laboratory, Building 10. The work involves installing outside air ventilation ducts, air tempering, heating and cooling coils, controls, and modification of the air distribution, heating and ventilation systems. Existing ventilation is inadequate for housing 20 employees, laboratories, and shops. Currently, the basement is periodically ventilated by exhaust fans which adversely impact temperature, humidity and pressure within the Building 7/10/15 complex. Proposed work is required to correct existing HVAC system deficiency and to provide adequate HVAC for employees.

4. Modifications for Robotics Assembly and Servicing Simulation Facility (29).............. 730,000

This project provides for the modification of the Flight Hardware Bonded Storage Area of the Spacecraft Systems Development and Integration Facility by the addition of a mezzanine floor of 3.800 square feet, under the mechanical room. The additional floor includes 2,000 sq. ft. for automated data processing ADP support, and 1,800 sq. ft. of space for technical support. This project also provides for a 3,280 sq. ft. work station facility in the high bay area of this same room (the Flight Hardware Bonded Storage Area), a staging area of 960 sq. ft. at the end, and a staging area of 2,650 sq. ft. along the side and under the added mezzanine floor. This project is required to provide a Robotics Assembly and Servicing Simulation System for the development, analysis and verification of servicing procedures for the assembly and servicing of payloads on the Space Station.

5. Modifications of Small Payload Assembly Area in Instrument Construction and Installations Laboratory (5)................................ 700,000

This project provides for the following facility work: (1) Convert 5,000 sq. ft. of office space in the west high bay of the Instrument Construction and Installation Laboratory Building 5, to clean work area for assembly and staging of small payloads including the installation of a 5-ton crane; (2) Rehabilitate and modify 5,000 sq. ft. of institutional support contractor's administrative/storage space in Building 5 to house offices displaced from west high bay of Building 5; and (3) Construct a 3,000 sq. ft. prefabricated metal facility on-grade east of Soil Conservation Service Road, and south of the Mobile Equipment Support Facility, Building 27, compound to house the displaced institutional Support contractor from Building 5. Provisions for power, lighting, heating, ventilating, air conditioning, plumbing, and fire protection/detection, are included. All supporting utilities shall be extended from the Center's distribution network as required. The proposed sequential moves are required to accommodate the small payload facility and is also part of the

Center's long-range housing plan to recapture premium space at the main site for consolidation of technical support activities without new construction.

D. Jet Propulsion Laboratory (JPL) $2,460,000

1. Modifications to Buildings 168 and 169 700,000

This project will provide modifications to the fourth floors of the Instrument Systems Laboratory, Building 168, and the Earth and Space Science Laboratory, Building 169 to relocate the Regional Planetary Image Facility (RPIF) presently located in Space Flight Support, Building 264; and the Multimission Image Processing Laboratory (MIPL) presently housed in Space Flight Operations Facility, Building 230. The work consists of the removal of existing drywall partitions and the addition of new partitions to suit the proposed floor plan, including installation of new doors, frames and hardware and the modification of flooring and ceilings as necessary. Modification of the HVAC, power, lighting and communication systems will be provided to support the new requirements. The relocation will permit the above groups to consolidate their operations in a central location and thus provide for improved operational efficiency and effectiveness in performance of their missions.

2. Modification of Mariner Road 380,000

This project will provide for the modification of the south side of Mariner Road and the adjacent sidewalks in the section between Central Engineering Building 301, and Earth Space Science, Building 300. Approximately 660 lineal feet of textured concrete walkway is proposed. This walkway will include grates, landscaping and street light standards. Also included is a bus stop shelter on the southeast corner of Mariner and Surveyor Road, a very busy waiting area. A new retaining wall and handrails will be incorporated in a segment west of Surveyor Road. A population of over 2,000 people will be occupying the buildings immediately adjacent to this segment of Mariner Road. A substantial safety problem exists when people walk in the narrow street at lunch and other peak traffic movement periods. This modification will channel pedestrian traffic onto a safe walkway.

3. Modifications of Jato Road, East Gate 700,000

The project will provide the following: (1) Modification of Jato Road featuring an improved alignment and increased road width, to serve as the main entry-way to the Laboratory from the East Gate. (2) Construction of off-road parking to facilitate security checking of vehicles at the East Gate. (3) Construction of parking for 64 cars in the area of existing Jato Road and portion of Explorer Road easterly of Mariner Road junction. (4) Lighting, landscaping, irrigation, handicapped parking and improved pedestrian and vehicular access to Laboratory Facilities in the project area. The project also requires the demolition of substandard 40-year-old Buildings 20, 23, 31, 32, 81 and 134, and construction of retaining walls along the hillside and the south edge of the realigned Jato Road. This modification project is a vital element improving the vehicular circulation system and parking at the East Gate area.

4. Modification of Site Electrical Distribution System 680,000

This project provides for electrical modifications which will eliminate 66 kilovolt (kV) overhead feeders, combine lightly loaded transformers, Banks 11 and 63, convert the power distribution at electrical Bank 41 to a more reliable system, convert substation F from a 2.4kV to a 16.5kV system and upgrade 23 power distribution banks. The power demand from Substation C has decreased considerably with the shutdown of a major portion of the Wind Tunnel, Building 79. In addition, the removal of the substation permits the removal of the last overhead power lines. This will increase the power efficiency and reduce power and maintenance costs.

E. Johnson Space Center (JSC) $3,500,000

1. Modify Flight Control Room 1, Mission Control Center 250,000

This project provides for modifications to Flight Control Room (FCR) 1 of the Mission Control Center, Building 30, to support replacement of obsolete mission status display/tracking equipment. Modifications include replacement of display screens, screen walls, and projection platforms. Work also includes modifications and improvements to the electrical power, lighting, air-conditioning and fire suppression systems.

2. Modify Laboratory Support Facility (34) 280,000

This project provides an environmentally controlled space to store Space Station robotic devices in the Laboratory Support Facility, Building 34. Air-conditioning will be provided for the remaining high-bay portion of the building; lighting and electrical provisions will be improved; and a soundproof wall will be installed around the large transformers that must remain inside this building. For added utilization of the building volume, a mezzanine of approximately 2,400 square feet will be installed over the existing laboratory area.

3. Modify Fire Alarm and Detection System (WSTF) 420,000

This project provides for the rehabilitation of the existing obsolete and unreliable fire alarm and detection system at the White Sands Test Facility (WSTF). The work includes installation of new fire and smoke detection systems in the buildings and test cells with connection to a new central console in the Emergency Center Building, facility 112. The new system also will supervise and control the existing Firex systems and provide capability for expansion. Problems affecting the reliability of the existing system require that these modifications be made for safety reasons.

4. Modifications for Extravehicular Activity Systems (7).................................... 720,000

This project is required for Space Station (SS) crew support subsystem testing. This project will modify the 20-foot vacuum chamber complex in the Crew Systems Laboratory, Building 7, to expand and upgrade the existing airlock volumes. Work includes removing the existing 10-foot chamber and 20-foot chamber anteroom; installing a lower level entry room and providing access to the existing 20-foot chamber; constructing a crew lock, incorporating an elevated entry and donning/rescue room; installation of an equipment lock and an observer lock and entry clean room. Test capabilities will include man-rated Space Station airlock systems, extravehicular mobility wind/airlock interfaces, airlock system procedures, astronauts operation of extravehicular activity systems and real-time resolution of mission anomalies. A lift system and a fire detection system with alarms and suppression capability are included.

5. Rehabilitate Central Energy Management System.. 700,000

This project provides for rehabilitation of the central energy management system by replacing the existing utilities control system (UCS) central control processor and peripheral equipment with increased capacity to support new buildings coming on line. The new equipment will consist of dual central control processors and necessary peripheral equipment such as a system console, disk drives, cartridge tapes, printers, terminal servers, and operator monitor stations in the Central Heating and Cooling Plant, Building 24. Electrical power will be backed up by a standby uninterruptible power supply.

6. Modifications for Fire Protection, Project Management Building (1)..................... 630,000

This project provides for the installation of an automatic fire sprinkler system in the Center's main administration building. The project work includes the installation of sprinkler heads, piping modifications and connection to the fire protection riser piping. The existing riser piping complies with the appropriate standards of the National Fire Protection Association (NFPA). Project work also involves removing asbestos and will be accomplished during off-working hours to minimize impact on operations. This work also provides a level of fire safety equivalent to NFPA Standard 101 for this nine-story office building.

7. Installation of Automatic Sprinkler System (37).. 500,000

This project provides for the installation of an automatic sprinkler system in the Life Sciences Laboratory, Building 37. Approximately 83,000 sq. ft. of office and laboratory area will be protected by the new sprinkler system. The work also will include spot removal of asbestos in the ceilings to facilitate installation of the sprinkler system. The installation of automatic sprinklers provides the necessary level of protection for this building and will bring the facility into compliance with applicable codes.

F. Kennedy Space Center (KSC) (MG-0794) $3,990,000

1. Modify Supply Warehouse #1 for Space Station Spares 515,000

This project will provide for modifications to Supply Warehouse #1 to air-condition approximately 30,000 sq. ft. of existing storage space to accommodate Space Station logistical and flight hardware spares. The space will be utilized to support logistics and resupply operations, material handling and staging, processing and storage. Existing and planned facilities capable of supporting Space Station activities at KSC are required to support ongoing Space Transportation System (STS) operations. This facility will provide storage space for several thousand orbital replacement line items.

2. Modify Supply Building M7-505 for Space Station Logistics 695,000

This project will provide for modifications to Building M7-505 to support Space Station logistics/ resupply operations, material handling/staging, processing and storage. Approximately 16,000 sq. ft. of space will be air-conditioned and will include internal building modifications, ductwork, air-handler installation and the extension of a chilled water pipeline from the Operations and Checkout (O&C) Building. The chilled water pipeline will replace two existing chillers which have exceeded their useful life expectancy and are in need of replacement. Existing/planned facilities capable of supporting Space Station activities at KSC are required to support ongoing STS operations/payloads.

3. Modify Advanced Telescope Mount (ATM) Clean Room Crane (M7-355) 365,000

This project will upgrade the ATM cleanroom located on the west side of the O&C Building High Bay. Included in this upgrade are structural modifications to the second level framing and the addition of four new columns. The existing perforated floor panels will be replaced to achieve a class 10,000 (10K) cleanroom environment. The existing 1-ton crane will be replaced with a 5-ton crane and a pressure-controlled anteroom will be provided to maintain the cleanroom environment during component entry. Since the cleanroom can readily provide a class 10K cleanliness rating, it is the only place in the O&C building where payloads requiring this capability can be integrated. Increasing the crane capacity to 5-tons will allow the heavier, cleanliness sensitive type payloads, such as telescopes, to be integrated in the cleanroom.

4. Modify Launch Complex 39 (LC-39) Fire Alarm System 725,000

This project provides for the replacement of the existing fire alarm control and monitoring systems at LC-39 facilities with a computer-managed centralized system which complies with the requirements of National Fire Protection Association (NFPA) for a central supervising station. The existing alarm systems are unreliable and do not provide for timely and efficient evaluation of fire signals, and have become so obsolete that repair parts are becoming difficult, if not impossible, to obtain. The existing systems do not have the capability of monitoring individual alarm zones and cannot support the new facilities that are coming on line.

5. Modify LC-39 Helium Converter Compressor Facility (CCF)................................ 720,000

This project upgrades the existing CCF by integrating two additional helium compressors, manifold piping, valves, and instrumentation into the existing system. The shelter will be expanded to house the new compressors and additional area will be provided for tube bank trailers to allow increased helium induction. The existing 22-year-old compressors have been derated, spare parts are limited and reliability is inadequate to meet the helium requirements for the current STS "launch-scrub-turnaround" scenario.

6. Upgrade Fire Detection System, Solid Rocket Booster (SRB) Rotation & Surge Buildings.... 495,000

This project provides for modifications to the fire detection, alarm, and reporting system in the SRB Rotation Building and Surge Buildings to provide a centralized, automatic, reliable system which alarms and evacuates all buildings in this area. The project includes the installation of ultraviolet and infrared sensors and the relocation of the control panel from the Rotation Building. Currently, the Rotation Building is provided with a fusible link automatic sprinkler system. Due to the lack of heat shields and large open volume of the facility, a major fire could occur prior to system activation and, thereby, a high probability of SRB ignition before evacuation. The Surge Buildings are not equipped with automatic detection and, as a result, a minor fire could burn unnoticed. In addition, the present complement of manual pull stations does not ring evacuation bells at any other nearby facilities, thus exposing personnel to SRB hazards should ignition occur.

7. Rehabilitate Communication Maintenance and Storage Facility (MG-0791)................... 475,000

This project provides for the general rehabilitation of the 23-year-old Communication Maintenance and Storage Building to provide economical and efficient operation of communications maintenance in support of Shuttle launches. The air-conditioning system and lighting are insufficient for operations and floor space is poorly configured. The rehabilitation includes the air-conditioning system, lighting, floors and walls and external parking lot paving.

G. Langley Research Center (LaRC).. $3,335,000

1. Modifications to the 22-Inch Helium Tunnel (1247B)..................................... 335,000

This project provides modifications to the 22-Inch Helium Tunnel to provide a Mach 15 nozzle to fit within the existing tunnel configuration. Work includes the design, fabrication, and installation of the Mach 15 nozzle. This facility is the only high Mach number facility with the freestream flow within the shock layer of a thermally and calorically perfect model. The proposed modifications will provide data in the Mach number/Reynolds number range that is not presently available.

2. Modifications to the 8-Foot Transonic Pressure Tunnel (640)............................ 725,000

This project provides for modifications to enhance flow quality in the tunnel test section. Modifications include the removal of existing diffuser spoilers, fabrication and installation of a remotely controlled, two-wall adjustable choke. Modifications will improve flow quality in the test section, provide high-quality test capability for performing laminar flow research, code validation experiments and flow diagnostic measurements.

3. Rehabilitation of Structures and Materials Research Laboratory (1148)................... 595,000

This project provides for the rehabilitation of 6.800-sq. ft. of office and laboratory space. Work includes refurbishing walls, ceilings, windows, lights, rest rooms, fire exits, heating, ventilating and air-conditioning system, plumbing systems and electrical circuits. The laboratory is over 45 years old and has not been upgraded since its original construction.

4. Rehabilitation, Model Support System, 12-foot Low-Speed Tunnel (644).................... 615,000

This project provides for the rehabilitation and upgrade of the model support system capable of automatic pitch and yaw changes during tunnel runs and manual roll changes between tunnel runs. Work includes fabrication and installation of a new model support system. The existing model support system is severely deteriorated, which results in large tolerances making it difficult to accurately set and hold model angles during tunnel runs. The new model support system will allow the facility to meet current and projected research needs.

5. Modifications to the Aircraft Noise Reduction Laboratory (1208)........................ 385,000

This project provides modifications to obtain high-subsonic flow (MACH 0.9) though an existing 12-inch diameter nozzle in the anechoic test chamber. To achieve the enhanced flow conditions. The existing air supply system will be upgraded with a new 10-inch line, new isolation values, filters, and controls. Additionally, the existing 12-inch nozzle assembly will be modified to achieve MACH 0.9 flow by adding a new settling chamber and nozzle insert.

6. Modifications to the Central Scientific Computing Facility (1268 and 1268A)............. 450,000

This project provides modifications to upgrade the fire protection system and alternate power source serving this facility. The computer equipment in this facility supports all of Langley's programs involving analytical and engineering studies. The existing fire protection system is obsolete and many replacement parts are no longer available. The existing alternate power source does not provide the adequate capacity to keep critical equipment running during local substation outages. This project will ensure system efficiency, reliability and safety.

7. Modifications to the 480 Volt Power Supply Serving Building (1212) 230,000

This project provides modifications to upgrade the fire protection and backup power systems. The modifications to the 20-year-old fire protection system include removal of the existing high-voltage obsolete equipment and replacement with a new low voltage system of smoke detectors, controls, wiring and conduit. The existing backup power source will be modified to increase the "standby" power available for critical applications. The existing alternate power source does not provide adequate capacity to power all critical equipment should a local substation outage occur.

H. Lewis Research Center (LeRC) $3,615,000

1. Rehabilitation of Protective Relay System, Substation "A' (200) 690,000

This project provides for rehabilitation of the protective relay system at Substation "A". Work includes replacement of two 138 kV disconnect switches, installation of communications relaying link between the power utility company and the substation, relaying improvements for line protection, breaker fault protection, transformer differential and backup protection, transfer trip and breaker control improvements. The present substation configuration and relaying arrangements causes outages and electrical instability problems between supplier and the large wind tunnel drive motors. Additionally, potential faults can cause shutdown of many critical loads at the center.

2. Rehabilitation of Mechanical Systems, Engine Components Research Laboratory (ECRL) (102) 720,000

This project provides for the rehabilitation of mechanical and electrical systems. Work includes installation of new atmospheric exhaust stack for cell 1, separate new 150 pounds per square inch gauge (psig) combustion air service to both cells, and new separate, increased electrical services to each cell. This rehabilitation will also provide for separation of exhaust cooling water return from the existing 72-inch diameter altitude exhaust line. The new exhaust cooling water return line will prevent further corrosion of the existing altitude exhaust system. At present, the inadequate and combined mechanical and electrical services to the test cells hinder or prohibit concurrent testing, limiting usefulness. The separation of mechanical and electrical systems serving cells 1 and 2 will permit increased use, flexibility and productivity.

3. Modifications to Chilled Water Plant, South Area 500,000

The Project provides for the installation of two 600-ton chillers. Work includes one chilled water recirculating pump, one cooling tower water booster pump, a 14-inch diameter interconnecting water return line and associated piping, electrical cabling, controls, and instrumentation for a complete system operation. Removal of two 180-ton chillers, with associated piping and controls is also included. These modifications will result in a reduction in electrical power consumption and much lower maintenance costs.

4. Rehabilitation of Vacuum Facilities, Electric Propulsion Research Building (EPRB) (16).. 710,000

This project rehabilitates five vacuum facilities in the EPRB and includes replacement, modernization and addition of various instrumentation, relays, programmable controllers, graphic and annunciator panels, vacuum gate valves, blower/roughing pumps, oil diffusion pumps and wiring. The chambers are approximately 25 years old. Mechanical components need replacement and instrumentation and controls need modernization to improve space simulation capabilities and to relieve present overscheduling in the large vacuum tanks.

5. Rehabilitation of Proprietary Protective Signaling System.............................. 355,000

This project provides a signaling system for fire protection to all the Lewis Research Center facilities. Work includes installing new signaling panels, new emergency voice communication system and back-up equipment for emergency use. Currently less than half of the Center is protected by a proprietary fire alarm monitoring system. Additionally, the Center does not have a system of dedicated emergency communications to the Fire Station. The installation of this system will provide the Center with an emergency communication system to increase safety and protection for property assets.

6. Rehabilitation of Drop Tower Building (45).. 640,000

This project provides for the rehabilitation of the Drop Tower which is used for Microgravity Science and Applications research. Work includes rehabilitation of roof, windows, siding, floors, foundation walls, electrical and mechanical systems. This project also provides construction of an 850-sq. ft. addition with retaining walls. The building addition will be used for experimental build-up, assembly, check-out and testing of hardware for reduced gravity research in fluid behavior and combustion. This building was constructed in 1945 and rehabilitation is required to correct deteriorated and nonfunctional systems.

I. Marshall Space Flight Center (MSFC) $3,900,000

1. Modifications for Orbital Maneuvering Vehicle (OMV) Avionics/Software Verification Laboratory (4476) 690,000

This project will modify the center section of Building 4476 for the OMV flight type avionics laboratory. Approximately 5,000 sq. ft. is required which includes raised floor areas, 3-phase, 208-volt, 200-amp power, air-conditioning, lighting and internal building rehabilitation. The OMV avionics/software verification laboratory is required for long-term sustaining engineering. This simulation laboratory will verify hardware/software/interface changes, provide capability to resolve inflight anomalies and provide quality assurance and enhance safety.

2. Rehabilitate Surface Treatment Facility (4760) 730,000

This project provides for the general rehabilitation of the north line surface treatment tanks. The effort will include cleaning, repairing, painting, and insulating the exterior of eight process tanks; replacing tank liners; replacing deteriorated process piping and pumps; replacing 14-foot-wide rollup door with a 20-foot door on the north side of the paint shop; removing a drying oven; painting the interior surface treatment portion of Building 4760; replacing floor grid; and replacing deteriorated electrical and ventilation systems. The corrosive nature of the environment in this surface treatment facility has severely deteriorated this equipment. Expedient repair will continue until this general rehabilitation can be accomplished.

3. Rehabilitate Office Building 4666 390,000

This project will provide for the rehabilitation/upgrading of approximately 45,000 sq. ft. of Building 4666. The work includes removing and relocating partitions, renovating and ventilating rest room areas, refurbishing and modifying the power systems and interior painting. Rehabilitation is required to modernize and improve the general conditions and appearance of the office and computer areas to promote employee morale and productivity, to provide for more effective utilization of the limited existing space and to facilitate personnel relocation in response to future work assignment and organizational shifts.

4. Modification to Straylight Test Facility (4487) 740,000

This project provides for upgrading Straylight Test Facility to provide additional pumping capability, a repressurization system and oil baffleing for the vacuum chamber. The room also will be modified to become a class 10K clean room and support utilities such as power, water, computer interface and electrical controls which will be installed as required. A 100K clean room laboratory will be built to provide an area for test article buildup and cleanup before entrance into the 10K clean room. The Straylight Test Facility is required to provide needed straylight testing in support of optical payloads such as the Hubble Space Telescope. Straylight control is critical to support present mission success and will also provide a means to aid research and development for all future missions.

5. Modification of Design and Analysis Computer Facility (4610)........................... 680,000

This project provides for modifications in Building 4610 to install a 500-kilovoltamps (kVA) uninterruptible power system (UPS). The UPS battery pack, switching gear and emergency generator will be located in a protective enclosure on ground level, south of Building 4610. Presently, electrical outages or voltage fluctuations from storms or electrical system problems result in interruption to the equipment. A half day or more can be required to recover to operational status. Data /programs and approximately 35 man-days of productive manpower are lost for each outage. A UPS will eliminate this serious problem.

6. Rehabilitate Building 4250 for Administrative Support.................................. 670,000

This project provides for the rehabilitation and modification of both the interior and exterior of Building 4250 including utilities, HVAC, lighting, rest room facilities, partitions, floors and ceilings. Building entrances, parking areas and access roads will be upgraded and expanded. Building 4250 was constructed in 1962 primarily for use as a facility maintenance shop and supporting office area. The systems are old and inadequate for current and planned use. A general rehabilitation of the building is required to bring it up to acceptable standards for use as general office space.

J. Michoud Assembly Facility (MAF)... $1,295,000

1. Modify Fire Water Pumps... 425,000

This project provides for relocation of three 2.000-gallons per minute (gpm) fire water pumps from Building 239 to Building 201. Work includes pump modifications, relocation of one diesel backup power generator, lowering two 54-inch pipes connecting Buildings 239 and 201 sumps and installation of a new control system. Maintaining a minimum water level in the Borrow Pit is critical to maximizing Building 103 drainage during heavy rainfall. Relocation of the pumps to prevent cavitation, which results from a decrease of the Borrow Pit water level, will maintain the needed Building 103 fire protection requirement at the safe level of 6,000-gpm for a 4-hour period.

2. Modify Substation No. 43... 230,000

This project provides backup transformers to production critical Buildings 451 and 452. The work includes installation of a 750-kVA transformer, extension of a existing pile supported concrete foundation, installation of a 13.8-kV switch and the 480V switch gear (circuit breakers, panels, cabinets, etc.).

Substation 43, a single-ended 750-kVA unit, provides power to liquid hydrogen (LH_2) Pneumatic Test Facilities in Buildings 451 and 452. Production outages are required for substation maintenance which delay critical test operations.

3. Rehabilitate East Master Switchgear.. 640,000

This project provides for the rehabilitation of the East Master Substation by the replacement of the 13.8 kV electric power switchgear served by feeders 8-17 in the substation control shelter. Work also includes replacing associated equipment and cabinets, adds power factor capacitors, and provides the capability to switch existing power factor correction equipment from temporary connections to dedicated breakers. The East Master Substation is the primary source of electrical power for the production facilities in Building 103 of MAF. The switchgear and related equipment is over 35 years old, deteriorated, and spare parts are difficult to obtain. Rehabilitation of the substation will minimize potential production disruptions or shutdowns because of the failure of critical substation equipment.

K. Stennis Space Center (SSC).. $2,200,000

1. Rehabilitation of B-2 Test Position, Building 4220...................................... 450,000

This project provides for rehabilitation of the Static Firing Test Stand Central Core and Position B-2. Work includes removal of asbestos under the checker plate floor on Level 11; installation of centralized HVAC system in the Center Core; and installation of grid-type drop ceilings. This facility was constructed in 1966 and continuous exposure to adverse environmental conditions has resulted in significant and extensive corrosion and deterioration on the B-2 position and most of its supporting facilities. The supporting structures, systems, and areas require rehabilitation in order to adequately maintain current engine test programs.

2. Modification of Utility Control System, Test Complex.................................... 450,000

This project will provide for expansion of the Utility Control System (UCS) in the Shuttle Main Engine Test Complex B. Modifications will include 450 control and sensor points, wire and ancillary equipment to be compatible with the existing UCS. The UCS is needed in the B Complex to optimize operation and maintenance manpower and provide for automatic monitoring and control of systems to optimize energy utilization in critical test-related utility systems.

3. Rehabilitation of Heating Systems, Maintenance/Logistics Support Area.................. 710,000

This project provides for installation of individual heating systems in the maintenance and logistic support area. Related modifications will be made in Building 2101, Hydroscience Center; Building 2105, Engineering and Logistics Building; Building 2201, Repair and Fabrication Shop (Site Maintenance); Building 2203, Flammable Material Storage Building; Building 2205, Repair and Fabrication Shop; and Building 2206, Repair and Fabrication Shop (Paint). The work includes necessary natural gas supply piping, gauges, controls, water piping and individual boilers for each building. The existing inefficient underground high temperature hot water (HTHW) system will be shut down after completion of this project. This will eliminate the high heat loss from the underground system and provide systems that can be effectively and efficiently controlled.

4. Modification of Sanitary Sewer System.. 170,000

This project provides for the sanitary sewer tie-in of three buildings (Test Support Operations Building, Building 3305, and Building 8201) into the existing sanitary sewer system lift station #1 north of Road "L." Included in this project is the installation of a 200-gpm lift station, 6,000 linear feet of four-inch polyvinyl chloride (PVC) force main, a collection system consisting of 1,700 linear feet of 6-inch diameter PVC gravity flow lines and five sewer manholes. All of the buildings in this area are currently on separate septic tanks and leach fields. The implementation of this project will enhance compliance with Federal, State, and local regulations.

5. Modification of Diagnostic Testbed Fac. for Development of Plume Diagnostic Sensors..... 420,000

The project consists of modifying and expanding the existing Diagnostic Testbed Facility to provide a capability to perform advanced plume diagnostic instrumentation experiments and sensor development. Work includes an additional thruster test fixture; experiment test fixture; vitrolic joint (VJ) oxidizer tank; fuel tank; VJ pipe, valves, and fittings; inert gas pressurant system, controls and instruments; fire protection system; control/work room; data acquisition and analysis equipment; site preparation: and utilities. The facility will allow for development of sensors in a reasonable time by allowing simulation of failures of the Space Shuttle Main Engine (SSME).

L. Wallops Flight Facility (WFF).. $1,865,000

1. Modification of Range Control/Evaluation Facility (N-159)............................. 525,000

This project includes the rehabilitation and modification of the east wing of Building N-159 to accommodate the Space and Earth Sciences operations. The work will include the modification of interior partition construction, interior finishes, computer flooring, fire suppression system alterations, and HVAC/electrical system modifications. This project is required to upgrade the space in N-159 vacated by the move of the Control Center to make it usable as office and laboratory space for the Space and Earth Sciences operations at Wallops. This will allow the most economical utilization of the existing space at Wallops.

2. Modifications for Flood Protection, Various Buildings 425,000

This project provides for the flood protection of Assembly Building Y-15, Island Radar Control Facility Building V-60, Range Service Building X-15, Island Paint Shop building X-30, Telecommunications Building X-75, Assembly Building W-65, Payload Assembly Laboratory Y-40 and various terminal buildings. Work includes installing light weight lift-out flood panel systems in all personnel and overhead doors. Building penetrations and cracks will also be sealed. The facilities listed are used in rocket/payload checkout and launch operations. Due to the deterioration of the seawall and the subsequent increase of flooding on Wallops Island, these structures must be protected from damage caused by tidal flooding.

3. Rehabilitation and Modification of Building N-116 425,000

This project provides for the rehabilitation of the one-story 16,300 sq. ft. Logistics Facility Building N-116. The work includes the removal of existing deteriorated metal wall and roof panels, insulation, mechanical and electrical systems. The installation of insulated metal wall and roof panels, electrical coiling steel doors, personnel doors, painting of existing painted steel structure, new electrical wiring, lighting, heating and ventilating systems. Building N-116 is over 30 years old and requires excessive maintenance due to age and deterioration. New systems will help eliminate problems caused by old electrical wiring, deteriorated exterior roof and wall panels, insufficient lighting and poor ventilation.

4. Modifications for Fire Protection System at the National Scientific Balloon Facility (NSBF) 490,000

This project provides for the upgrade of the water distribution system to provide fire protection at the NSBF in Palestine, TX. The work includes the installation of approximately one mile of eight-inch feeder distribution piping, a 75,000 gallon elevated storage tank, eight fire hydrants, control system, eleven building services and control valves. There is presently inadequate water and pressure to fight a fire at the NSBF. Extensive inventory of equipment, balloons, and site personnel are at risk without adequate water to control a fire. Forest and grass fires have already burned to within a few hundred feet of critical buildings and equipment. This project will provide the needed water supply for fire fighting.

M. Various Locations. $1,400,000

1. Modifications for Fire Protection System, Madrid, Spain 660,000

This project provides for the modifications to the fire protection system at the Madrid Deep Space Communications Complex, Spain. Modifications include the installation of an additional fire water supply with a 50,000 gallon storage tank, deep well, pumps, and related equipment. The fire detection system will be replaced with a computerized fire detection and alarm control system providing individually addressable alarm reporting. A high expansion foam system will be installed to protect the ant nna and tower at Deep Space Station (DSS)-63. The present fire detection an0 suppression system requires modifications due to changes in building use, operational activities and fire protection codes. These corrective measures will provide an improved level of safety for personnel and equipment.

2. Modification of Power Distribution System, Goldstone, CA 740,000

This project provides for modifications to the electrical power system at the consolidated Goldstone Tracking and Data Acquisition Complex, California. This includes the installation of 5.8 miles of a direct burial 12.5-kV electric power line from the Echo site to the Apollo site (DSS-16). The Echo interface will include a 1500-kVA transformer with related equipment. Electrical power will be provided to the Apollo site from the Mars and Echo generating plants utilizing separate powerline circuits with improved operational reliability. These modifications provide for the disconnect and removal of the commercial metered service entry at DSS-16 and the permanent shutdown of the Mojave generating plant with savings anticipated in operation and maintenance costs.

MISCELLANEOUS PROJECTS NOT IN EXCESS OF ~150,000 EACH...... 1,720,000

TOTAL 36,000,000

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

An estimated $36,000,000 to $40,000,000 per year will be required for continuing rehabilitation and modification needs.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1990 ESTIMATES

SUMMARY

MINOR CONSTRUCTION

Summary of Project Amounts by Location:	Amount	Page No.
Ames Research Center	$ 475,000	CF 13-2
Dryden Flight Research Facility	480.000	CF 13-3
Goddard Space Flight Center	370,000	CF 13-3
Jet Propulsion Laboratory	960,000	CF 13-3
Johnson Space Center	1.155.000	CF 13-4
Kennedy Space Center	1.560.000	CF 13-5
Langley Research Center	1,335.000	CF 13-6
Lewis Research Center	940.000	CF 13-7
Marshall Space Flight Center	980.000	CF 13-7
Stennis Space Center	980,000	CF 13-8
Wallops Flight Facility	400.000	CF 13-8
Miscellaneous Projects Not in Excess of $150,000 Each	365.000	CF 13-9
Total	$10.000.000	

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1990 ESTIMATES

PROJECT TITLE: Minor Construction of New Facilities and Additions to Existing Facilities, Not in Excess of $500,000 Per Project

INSTALLATION: Various Locations

FY 1990 CoF Estimate: $10,000,000

FY 1988: $8,000,000 FY 1989: ~9,000,000

COGNIZANT INSTALLATIONS/LOCATIONS OF PROJECT: Various Locations

COGNIZANT HEADQUARTERS OFFICE: Office of Management

SUMMARY PURPOSE AND SCOPE:

These resources will provide for minor facility construction at NASA field installations and Government-owned industrial plants supporting NASA activities. Each project included in this program is estimated to cost not more than $500,000 and involves either the construction of new facilities or additions to facilities. The FY 1990 request of $10,000,000 will improve the usefulness of NASA's physical plant by changing the utilization of or augmenting the capabilities of various facilities. Included in this request are those programmatic and institutional projects that are essential to the accomplishment of mission objectives.

PROJECT JUSTIFICATION:

The configuration of NASA's physical plant necessarily must respond to changes in utilization and adaptations required by changes in technology or in mission needs. Demands are generated by research, development, test, and similar activities. Specific justification for each minor construction project is provided under "PROJECT COST ESTIMATE."

PROJECT DESCRIPTION:

Included in the FY 1990 minor construction program are those facility projects for institutional or technical facility needs which could be fully identified at the time of submission of this budget estimate. Items of work totalling $10,000,000 are included in this resource request and have been distilled from a list totalling over $19,277,000. Projects were selected on the basis of the relative urgency of each item and the expected return on the investment. Only those projects estimated to cost not in excess of $150,000 have not been individually described or identified by center. The total cost of these miscellaneous projects is $365,000. During the course of the year, rearrangement of priorities may require changes in some of the items to be accomplished. Such changes will be accommodated within the resources allocated.

These projects represent requirements that must be met in this timeframe to support institutional needs and programmatic objectives. The following listing summarizes the cost distribution by category of work:

a.	General Purpose Buildings..	$4,620,000
b.	Technical Buildings/Structures	5,015,000
c.	Pavements	365,000

PROJECT COST ESTIMATE:

A. Ames Research Center (ARC) $475,000

1. Construction of Sting Assembly and Storage Facility (N-227) 475,000

An existing area of N-227 will be expanded by 1,000 square feet to provide additional space for storage of wind tunnel stings and taper gauges, a working area for assembly of stings and adapters, and installation of a new support system to assist in sting assembly and certification. This area is needed to consolidate sting storage and assembly/check-out for support to the Unitary Plan Wind Tunnel and to provide for proper environmental protection and sting inventory control. Suitable storage space does not currently exist, and damage to existing stings has been experienced because of this situation.

B. Dryden Flight Research Facility (DFRF) $480,000

1. Construction of Laboratory Addition, Building 4820 480,000

This project provides for a 2,400 square feet addition to Building 4820 to provide needed laboratory space to support the existing Flight Loads Research Facility in Building 4820. Laboratories to be provided include a new optics laboratory, a strain gauge laboratory, electronic equipment testing laboratory and temperature sensor development laboratory. Existing space is not adequate to provide for these activities, or to provide secure work areas for sensitive testing. The new addition will be designed to structually add a second floor area should it be required in the future. The new area will be provided with power, environmental control, and restroom facilities as required.

C. Goddard Space Flight Center (GSFC) $370,000

1. Construction of Truck Lock/Staging Facility at Building 5 370,000

This project provides for the construction of a 3,000 square foot, truck lock/staging facility addition to the Instrument Construction and Installation Laboratory, Building 5. The new facility will be located on-grade at the northeast corner of the building. Work includes a 15-ton bridge crane, heating, and air conditioning, power, lighting, fire detection/protection, and other utility support systems. The truck lock will separate the precision flight hardware machining and assembly operations in the building from the elements during loading and unloading of trucks. When the existing doors are open contamination gets into the building and upsets the critically sensitive operations. This truck lock will act as a barrier to outside contamination.

D. Jet Propulsion Laboratory (JPL) $960,000

1. Construction of Handicapped Facilities, Various Buildings 480,000

This project provides for the construction of new access facilities for a complex of three 2-story buildings (Procurement Office, Building 190; Facilities Engineering/Services, Building 200; and Carpenter Shop, Building 201) to make them accessible to the handicapped. The work includes modification of a toilet complex on the second floor of Building 190, alterations to access doors, interconnection of the upper floors of Buildings 190, 200, and 201 with ramped walkways and provision of a hydraulic elevator to provide access to the second floor level. These buildings currently accommodate almost 200 people, but there is no access to the second floors except by stairs. This condition makes it very difficult or impossible for temporarily or permanently disabled people to use the second floors.

2. Construction of Addition to Gyro Laboratory, Building 251 480,000

This project provides for the construction of an approximately 2,100-square-foot addition to the east side of the existing Gyro Lab, Building 251. The addition will consist of single story steel and wood frame construction with exterior concrete masonry walls. Heating and air-conditioning, electrical and communication services, and toilet facilities will be provided in the addition. Building 251 was constructed in 1951 for the purpose of determinating the operating parameters of inertial sensors for spacecraft systems. The facility supported all Mariner programs after 1965 and is at present supporting Mariner Mark II and Space Relay Experiments. To accommodate the increased number of personnel supporting development effort in the aforementioned programs, key laboratory space has been converted into office space. Offices and computer stations occupying this key laboratory space will be moved into the addition, and the laboratory space will be returned to its original assembly and test areas.

E. Johnson Space Center (JSC) $1,155,000

1. Construction of Thermal Control Test Article Protective Enclosure 225,000

This project provides for construction of a 3,600-square-foot pre-engineered metal building for storage for Space Station thermal control system test articles. These items are used in the nearby Space Environment Simulation Laboratory (SESL), Building 32. The facility will include electrical power, lighting, air-conditioning, a gas detection system, site grading and a concrete pad. This project is required to support development and certification testing of Space Station thermal management system assemblies, and the existing SESL facility does not provide space to house assemblies which are not being used in tests. This project will provide an adequate, protective enclosure which will enable the safe reuse of these thermal control assemblies.

2. Construction of Liquid Hydrogen Service Facility 480,000

This project constructs a facility within the Thermochemical Test Area (TTA) to provide a concrete pad for storage of a liquid hydrogen trailer. The pad will be approximately 20 by 60 feet and will be provided with protective explosion barricades on two sides. Also included in this project are pole-mounted floodlights, electrical power outlets, a grounding system, a deluge fire protection system, and associated paving. Explosion hazards will be reduced and current restrictions on operations and access to Building 353 during liquid hydrogen testing will be eliminated. This facility is the only location equipped to perform cryogenic acceptance tests on Orbiter recirculation pumps.

3. Construction of Advanced Communications Laboratories (44) 450,000

This project upgrades the southeast corner of the high-bay area of the Communications and Tracking Development Laboratory where Space Station/Tracking and Data Relay Satellite (TDRS) radio frequency interface test capability is provided. Project work includes replacing a temporary shelter for an existing 12.5-foot-diameter radome with a permanent enclosure, and constructing a shelter for a new 16-foot-diameter radome. The project also includes extending the existing high-bay mezzanine approximately 1,600-square-feet, and providing a laboratory with temperature and humidity controls, electrical outlets, and lighting in the extended area. This work will provide the capability to perform multi-element, end-to-end communications systems development, certification, problem investigation/resolution and network integration tests. The new mezzanine laboratory will support communications system test bed and advanced systems development requirements.

F. Kennedy Space Center (KSC) $1,560,000

1. Construct LC-39 A/B Emergency Support Facility 450,000

This project provides-for the construction of an approximately 4,500-square-foot facility between LC-39A and LC-39B for emergency fire and medical support. The centrally located facility will save both manpower and equipment and consists of areas for a dormitory, rest rooms, kitchen/dayroom, office, equipment storage, and emergency apparatus parking.

2. Construct Addition to Propellant Laboratory and High Pressure Gas Maintenance Facility 195,000

This project provides for the construction of an approximately 600-square-foot laboratory addition to the Propellant Laboratory and High Pressure Gas Maintenance Facility located along side the LC-39 crawlerway. The air-conditioned addition is required to perform analyses of hazardous chemicals to the latest Environmental Protection Agency (EPA) specifications and will have a roof-mounted hood vent system, deionized water, safety showers with floor drains, cabinetry and laboratory sinks.

3. Construct Hydrazine Service Cart Facility 480,000

This project provides for the construction of an approximately 1600-square-foot pre-engineered metal building to be used for storage and maintenance activities on the five Orbiter and three Solid Rocket Booster (SRB) hydrazine service carts. The proposed facility will provide protected areas for storage and maintenance of this launch critical ground support equipment (GSE), and assure that the carts are available to fully support Shuttle processing and launch schedules.

4. Construct Electrical Shop.. 435,000

This project provides for the construction of an approximately 6,000-square-foot concrete and metal electrical shop building for the Base Operations Contractor (BOC). The present temporary facilities of the BOC electrical power department are in poor condition and will be demolished. The new building will provide a permanent location for over 60 technicians to perform maintenance on electrical equipment and facilities.

G. Langley Research Center (LaRC).. $1,335,000

1. Construction of Addition to Building 1195.. 415,000

This project provides for an approximately 3,600-square-foot second-story addition to Management Operations Building Complex, Building 1195. The addition will match existing face brick and windows, and will include necessary heating, air-conditioning, plumbing and electrical systems. This addition will collocate legal office activities with acquisition and financial operations to optimize interaction and coordination between the two organizations.

2. Technical Library Addition (1194)... 430,000

This project provides for an approximately 3,000-square-foot, three-story addition to the library. The first floor will contain needed shelving for the extensive unclassified core collection and classics, the second floor will provide required space for confidential documents storage, journals and special documents, and the third floor will provide space for the Aerospace Research Information Network that links together all NASA libraries. The addition is needed to alleviate existing overcrowded and confined conditions.

3. Construct Space Technology Laboratory Addition (1232).................................. 490,000

This project provides a two-story addition of approximately 4.000-square-feet to Building 1232. Construction will be reinforced concrete foundations and floor slabs, structural steel frame, masonry exterior wall and will include necessary air conditioning, electrical and plumbing systems. The Space Technology Division is currently housed in three buildings. This will consolidate the operation and ease overcrowding in existing facilities.

H. Lewis Research Center (LeRC) .... $ 940,000

1. Construction of Addition to Building 7 490,000

This project provides for the construction of an approximately 2,400-square-foot addition to the Near-Field Antenna Test Facility, located in Building 7, which will increase the length of the present test field high bay area by 20 feet to accommodate testing larger antenna systems. The extension will also provide space for laboratory, control room, and office. The present facility cannot accept or test the larger antennas now being constructed for experimental investigations of highly directional antennas and antenna feed systems.

2. Construction of Addition to Building 208 450,000

This project provides for the construction of an approximately 3,000-square-foot addition to Storage Building 208 to provide safe storage of bulk chemicals, waste and flammable materials. Work includes an addition for storage of flammable liquids, receiving and dispensing room and modifications to the existing storage, office and toilet room. This will provide a facility for the proper storage dispensing of chemicals used in research activities. The present storage facility, Building 415, which houses the chemicals, is located in the flood plain and does not meet regulatory storage requirements.

I. Marshall Space Flight Center (MSFC) $980,000

1. Construct Addition to Cryogenic Test Facility (4628) 490,000

This project provides for construction of two new test cells and a control room to house the expanding needs for creep-rupture and thermomechanical fatigue test systems. Approximately 1.800-square-feet of office space will also be added to the front of the building and a separate concrete building, 25 feet south of the test cells, will be provided to house the hydraulic power supply.

2. Construct Reverberant Audio Facility (4487) 490,000

This project provides the capability to verify the acoustic design of habitable Space Station elements. Construction includes an approximately 2,000-square-foot reverberant audio facility consisting of at least two adjoining rooms adjacent to Building 4487. One room will be a specially designed reverberant audio chamber which is 18-feet high, 29-feet long and 24-feet wide to provide a uniform sound field for the audio range expected in Space Station elements (e.g., modules, nodes). The room will be acoustically insulated from the outside to allow the high-fidelity simulation of arbitrary sound levels and also to prevent disturbance of outside activities. A second room will contain electronics supporting the reverberant chamber.

J. Stennis Space Center (SSC).. $980,000

1. Addition to Data-Engineering Services (1110)... 490,000

This project provides for a new single-story building addition of approximately 6,000 square feet. Construction will consist of site development, utilities, concrete masonry building and mechanical/electrical systems. This addition is needed to achieve the consolidation of management and technical staff of the Data Services Department in support of institutional computer services required for operations of SSC.

2. Construction of Data Storage Building.. 490,000

This project provides for a new single-story building of approximately 8,000 square feet. The construction will include site development, a concrete masonry building with air-conditioning, mechanical, electrical and fire protection systems. The building will be constructed to meet standards established by the National Archives and Records Administration for records holding/storage areas. This facility is required for storage of Space Shuttle Main Engine (SSME) test data and contractual and engineering records.

K. Wallops Flight Facility (WFF)... $400,000

1. Construction of Recovery Systems Laboratory (F-10).................................... 400,000

This project provides for the construction of an approximately 4,100-square-foot two-story building addition to Technical Service Shop Building F-10. The first story will house the Flight Vehicle Systems Laboratory, and the second story will house the Parachute Laboratory. The pre-engineered metal building addition will include electrical, air conditioning and fire protection systems and a one-ton monorail hoist. The Flight Vehicle System Laboratory is needed for the inspection, fit checking, modification and preparation of igniter housings and recovery systems for integration, testing and evaluation, and flight preparation for supporting launch projects at Wallops Island and remote launch sites. The Parachute Lab is needed for inspection, modification, repair, and retrofit of parachutes and other aerodynamic decelerators for rocket programs.

MISCELLANEOUS PROJECTS NOT IN EXCESS OF $150,000 EACH.. $365,000

TOTAL $10,000,000

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

An estimated $10,000,000 to $12,000,000 per year will be required for continuing minor construction needs

FACILITY PLANNING
AND DESIGN

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1990 ESTIMATES

SUMMARY

FACILITY PLANNING AND DESIGN

	Amount	Page No.
Regular Requirements:	$13.900.000	
Master Planning..........	300.000	CF 14-2
Sustaining Engineering Support..........	1.400.000	CF 14-2
Preliminary Engineering Reports and Related Special Engineering Support..........	3.600.000	CF 14-4
Final Design..........	8.600.000	CF 14-5
Other Requirements..........	$12.400.000	CF 14-5
Space Flight Facility Planning and Design..........	4.800.000	
Aeronautical Facilities Revitalization Facility Planning and Design..........	5.800.000	CF 14-6
Space Station Freedom Facilities Planning and Design..........	1,800.000	CF 14-6
Total..........	$26.300.000	

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1990 ESTIMATES

PROJECT TITLE: Facility Planning and Design

FY 1990 CoF Estimates: $26,300,000

FY 1988: $16,000,000 FY 1989: $20,000.000

The funds requested in this estimate are required to provide for the following advance planning and design activities related to facilities activities and projects:

a. The accomplishment of necessary development and master planning for field installations and, where not otherwise provided for, the provision of continuing engineering support and special engineering management and other services.

b. The preparation of preliminary engineering reports, cost estimates, and design and construction schedules.

c. The preparation of final construction plans, specifications, and associated cost estimates and schedules required to implement construction projects.

d. The accomplishment of facilities siting and other investigations, studies and reports, where not otherwise provided for.

Regular requirements encompass the basic purposes outlined above. The "other requirements," while also in support of "regular" purposes, cover those special needs related to large, complex projects or specific programs considered to represent high potential future construction requirements for which early definition is essential. The large projects require more planning and longer lead time. Much of this planning must be completed prior to inclusion of the project in a budget request.

1. REGULAR REQUIREMENTS.......... $14,500,000

A. Master Planning.......... 300,000

Provides for update and development of existing field installation master plans. This effort includes facility studies, site investigations, and analyses of utility systems. The master plan documents will be updated to reflect as-built conditions since issue of previous plans, and to graphically represent the 5-year facility plan baseline for future development.

The NASA field center master plans are generally updated at 4-to-5-year intervals. On an agency-wide basis, the level of effort remains fairly constant. The master plans are essential as reference documents for land use planning, physical relationships of facilities, and proper orientation and arrangement of facilities. Representative candidates for FY 1990 master planning are as follows:

(1) Jet Propulsion Laboratory

An update of the facilities inventory base to include current utilization with emphasis on changes caused by recent facility planning, construction, and modifications.

(2) Ames Research Center

An update to reflect as built conditions of facilities and utilities, revised land use planning, and changes to 5-year planning.

B. Sustaining Engineering Support.......... 1,400,000

Provisions for facility studies and specific engineering support continue in importance as evidenced in recent years, and must be given high priority throughout FY 1990. These efforts are important due to changing cost trends in construction materials and fuels; the continuing importance of energy conservation and efficiency; and the operation and maintenance costs for the physical plant.

The following items are included in the FY 1990 requirements:

(1) Building Research Board

Covers annual support to the Federal Construction Council's (FCC) operations and provides for special studies that the Council will perform throughout FY 1990 to help advance the science and technology of Federal Government building and construction. The FCC is subordinate to the Building Research Board, National Academy of Sciences, and its activities are supported by several Federal agencies including NASA.

(2) Utilities Services/Rates Analysis

Provides resources for the support of utilities procurement and utilities control systems. This includes, but is not limited to, technical assistance, surveillance, and recommendations with regard to utility rates, contract negotiations, systems operations, and utilities control systems.

These resources enable the agency to ensure that fair and reasonable rates are charged under its major utility contracts. Essential and valuable technical assistance is provided to our field installations so that effective negotiations can be conducted with utility companies. Several major utility contracts per year require technical assistance as utility contracts are renewed throughout the agency.

(3) Facility Operation and Maintenance Analysis

Provides for continued engineering support for implementing improvements at NASA field installations relative to manpower utilization, work control systems, preventive maintenance, facilities management and reporting systems. Improvements will also involve techniques to identify where and how increases in productivity are possible. Included in this activity are field surveys to be conducted on a priority basis at selected NASA field installations to evaluate the effectiveness of the operations and maintenance management systems.

(4) Value Engineering Cost Validations and Analyses

Provides for engineering services to improve cost-effectiveness of facility projects by subjecting project design criteria, specifications and working drawings for specific material components and systems to a detailed independent review by engineering specialists in the particular area of involvement. Also provides services necessary to predict accurately and validate facility costs which will aid in resources planning for the various field installations.

(5) Facilities Utilization Analyses

Provides for the analyses of Agency-wide facilities utilization data covering (1) office and other types of building space; (2) designated major technical facilities; and (3) special studies comparing the utilization of technical facilities which are similar in type or capability, such as wind tunnels. Such analyses provide for (1) insights into and development of better methods of identifying underutilized facilities; (2) improved techniques to quantify level of facilities use; and (3) actions to improve facilities utilization. Work provides for review of each installation's inventory data base in support of the facilities utilization program. Surveys are necessary to validate the reported data in relation to a specific problem or need, and to assist in providing a credible foundation for plans to improve the utilization of facilities.

(6) Independent Analysis and Third Party Reviews

Provides the technical and engineering support, analyses, designs, and reviews required to verify, confirm and ensure suitability of construction designs or techniques relating to complex projects that involve high risk, safety or other significant considerations.

C. Preliminary Engineering Reports and Related Special Engineering Support 3,600,000

(1) Preliminary Engineering Reports (PER's) .... (3,000,000)

Preparation of PER's, investigations, and project studies related to proposed facility projects in the FY 1992 and FY 1993 Construction of Facilities programs are provided for by this estimate. These reports are required to permit the early and timely development of the most suitable project to meet the stated programmatic and functional needs. Reports provide basic data, cost estimates and schedules relating to future budgetary proposals. This request provides for PER's associated with proposed construction except as provided for in other requirements (paragraph 2) for Space Flight, Space Station, and Aeronautical Facilities Revitalization initiatives.

The estimated cost of PER support for FY 1992 construction projects is $2,500,000 which will permit updating of PER's for $40-50 million in construction, and the development of new PER's for an additional $75-100 million in projects.

An additional $500,000 has been included in this line for the completion of new PER's for approximately $25-40 million of construction projects which will be high priority candidates for inclusion in the FY 1993 Construction of Facilities program. The activity associated with FY 1993 will be confined to the highest priority candidates.

(2) Related Special Engineering Support .... (600,000)

Investigations and project studies related to proposed facility projects to be included in the subsequent Construction of Facilities programs are provided for by this estimate. Such studies involve documentation and validation of "as built" conditions, survey/study of present condition of such items as roofing and cooling towers, utility plant condition and operational modes, analysis and support of environmental impact assessments and statements, and other like studies. These studies are required to allow for the timely development of projects to meet the stated functional needs and to provide basic data, cost estimates and schedules for related future budgetary proposals.

D. Final Desi~n 8,6n0,000

The amount requested will provide for the preparation of designs, plans, drawings, and specifications necessary for the accomplishment of projects other than Space Flight, Aeronautical Facilities Revitalization and the Space Station Freedom. Amounts required for those efforts are included under other reauirements. Projects involved are planned for inclusion in the FY 1991 and FY 1992 programs. The goal is to obtain better facilities on line earlier at a lower cost.

The request will provide for final design work associated with construction proposed for the FY 1991 Program, estimated to cost $110 to $135 million, and for $10 to $ 5 million of high potential projects proposed for the FY 1992 program. The amount included for FY 199 candidates and for residual requirements of this nature which have accumulated from prior years' final design activities is $7,700,000. For FY 1992, $900,000 is included and the supporting rationale is much the same as that set out in the PER estimate.

2. OTHER REQUIREMENTS $12,400,000

Other facilities planning and design requirements primarily associated with specific space programs characterized by large size, long planning cycle, and/or complexity of scope are included in this particular request. These programs require a level of planning effort and length of design time beyond the more routine facility projects. These requirements must be provided beyond the regular and most recurrent facility planning and design needs.

A. Space Flight Facility Planning and Design .... (4,800,000)

These resources provide for early and progressive design, final drawings, specifications, and site investigations for Space Flight facilities in order to ensure the best design, good cost estimates and realistic construction schedules. The Shuttle recovery and operational era requirements include expansion and improvement of Shuttle processing, repair and maintenance facilities that support the launch rate, construction of operations personnel facilities, modification to the launch complex support facilities and modifications at various locations for space engine enhancement and testing.

B. Aeronautical Facilities Revitalization Facility Planning and Design.................... (5,800,000)

The amount requested will provide for preparation of preliminary engineering reports and final designs and specifications required for continuation of the Aeronautical Facilities Revitalization Program initiated in FY 1989. This is a structured multi-year effort to restore and modernize NASA's aging aeronautical research and development facilities at various NASA installations. Demand for these unique facilities at various NASA installations is growing and includes the National Aero-Space Plane (NASP) program, research on high-speed civil transports, and a new generation of military aircraft.

C. Space Station Freedom Facilities Planning and Design................................. (1,800,000)

This requirement is a continuing effort primarily for preparation of preliminary engineering reports and final design drawings, specification and associated site investigation required for construction of Space Station facilities at various locations. Included are automated and robotic sciences research, space sciences research, solar dynamics simulation, crew training, processing and prelaunch checkout facilities.

Total... $26,300,000

ENVIRONMENTAL
COMPLIANCE AND
RESTORATION

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
CONSTRUCTION OF FACILITIES
FISCAL YEAR 1990 ESTIMATES
SUMMARY

ENVIRONMENTAL 'LIANCE AND I

Summary of Project Amounts by Location:	Amount	Page No.
Ames Research Center	$ 900.000	CF 15-3
Dryden Flight Research Facility	1.000.000	CF 15-3
Goddard Space Flight Center	2.750.000	CF 15-4
Jet Propulsion Laboratory	1.310.000	CF 15-4
Johnson Space Center	1.960.000	CF 15-5
Kennedy Space Center	1,580,000	CF 15-6
Langley Research Center	1.000.000	CF 15-7
Lewis Research Center	3.000.000	CF 15-7
Marshall Space Flight Center	3.000.000	CF 15-8
Michoud Assembly Facility	1,650,000	CF 15-8
Stennis Space Center	550,000	CF 15-9
Wallops Flight Facility	590,000	CF 15-9
White Sands Test Facility	2.700.000	CF 15-9
Various Locations	290.000	CF 15-10
Miscellaneous Projects Not in Excess of $150,000 Each	2.880.000	CF 15-10
Studies. Assessments. and Design	2.090.000	CF 15-10
Remedial Investigations. Feasibility Studies. and Related Engineering	2,750,000	CF 15-10
Total	$30.000.000	

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1990 ESTIMATES

PROJECT TITLE: Environmental Compliance and Restoration Program

INSTALLATION: Various Locations

FY 1990 CoF Estimate: $30,000,000

FY 1988: $23,900,000 FY 1989: $26,000,000

GNI ATIONS OCATION OF PROJECT: V i . s

COGNIZANT HEADQUARTERS OFFICE: Office of Management

SUMMARY PURPOSE AND SC

These resources will provide for studies, assessments, remedial investigations (RI), feasibility studies (FS), related engineering, design and remedial projects for environmental compliance and restoration measures at NASA field installations and Government-owned industrial plants supporting NASA activities. The purpose of this program is to enable compliance with mandatory statutory environmental requirements and standards. The resources authorized and appropriated pursuant to this program may not be applied to other activities. The program includes such measures as studies or assessments to determine current status and options for remedial action, prescribed RI's and FS's as required by Federal environmental laws, environmental restoration, hazardous waste removal and disposal, cleanup and closures and removal of unsafe buildings and debris.

PROJECT JUSTIFICATION/DESCRIPTION:

Proposed environmental compliance and restoration projects and activities for Fiscal Year 1990 total $30,000,000 which has been distilled from requests of approximately $54,000,000. This program represents only a modest request in relation to total requirements for environmental compliance and restoration that must be implemented within the next several years. Based on relative urgency and potential health hazards, the following listed projects are the highest priority requirements and are currently planned for accomplishment in FY 1990. Deferral of these necessary remedial measures would make it impossible for NASA to comply with environmental law and will cause shutdown of critical NASA operations by individual State or Federal environmental authorities. Studies, assessments, and design costs are approximately $2,090,000. To comply with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and Superfund Amendments and Reauthorization Act (SARA) regulations, necessary RI's and FS's must be performed. The estimate cost for these activities is $2,750,000. Projects estimated to cost not in excess of $150,000 have not been described or identified by specific location. The estimated cost of these projects is $2,880,000.

For those projects greater than $150,000, the following broad categories of effort will be undertaken in Fiscal Year 1990. As studies, assessments, RI's, FS's, and designs progress, it is expected that priorities may change and revisions of the activities and projects may be necessary.

a. Air Pollution Abatement and Asbestos Management .... $ 1,640,000

b. Rehabilitation/Replacement of polychlorinated bipheryl (PCB) Transformers .... $ 4,210,000

c. Hazardous Waste Monitoring and Control $12,440,000

d. Replacement of Underground Storage Tanks .... $ 900,000

e. Rehabilitation/Upgrade of Treatment Systems .... $ 3,090,000

PROJECT COST ESTIMATE

A. Ames Research Center (ARC) $900,000

1. Construct Hazardous Materials Storage Facility 460,000

This project will construct a 2,000 square feet (sq. ft.) extension to the present cylinder storage dock that is located north of Building N-255 which will provide adequate and proper storage for hazardous materials as required by Federal, State and Santa Clara County regulations. This will also provids secondary containment. ARC is in violation for improperly storing and transferring hazardous substances.

2. Fill-in Underground Air Storage Facility 440.000

The abandoned underground air storage facility which consists of 50 air storage wells provides a direct path for aquifer mixing when the well walls begin to disintegrate and leak. Three of the 50 wells are currently leaking, and failure or leaking of the remaining wells is likely over the next several years. To meet the California State and Santa Clara County requirements for proper abandonment of wells, this project fills in 49 (seven clusters of seven wells) 10-inch diameter, 1200 feet (ft.) deep, air storage wells and one 1400 ft. test boring. The 50 holes will be filled with an impervious material to maintain aquifer separation. In addition to filling the holes, the upper casings of the two ruptured clusters will be jet grouted.

B. Dryden Flight Research Facility (DFRF) $1,000,000

1. Replace Leaking Underground Storage Tanks 700,000

This project will replace seven single walled, deteriorated underground storage tanks with new above ground tanks and the required secondary containment to conform with Federal, California State and Kern County storage tank regulations. These waste fuel tanks continue to leak after the one-time repair permitted by law. The only remaining course of action is replacement.

2. Demolition and Disposal of Asbestos Insulated Buildings 300,000

This project will completely remove and dispose of spray-applied asbestos within Buildings 4821, 4822 and 4830 prior to demolition of these buildings to meet Federal Environmental Protection Agency (EPA) regulations. These three 5,300 sq. ft. pre-engineered steel buildings with corrugated steel sheathing will be demolished after the asbestos material has been completely removed. The buildings are beyond repair and represent a hazard and maintenance problem.

C. Goddard Space Flight Center GSFC $2,750,000

1. Upgrade Electrochemical Plating Facility 2,500,000

This project provides an 7,450 net sq. ft. Electrochemical Plating Facility (EPF) east of and connecting to the Instrument Construction and Installation Laboratory, Building 5. The electroplating operations include: plating laboratory for plating flight hardware components (4,600 net sq. ft.); chemical staging area for storing chemicals in the plating operation (1,100 net sq. ft.); waste chemical storage facility for disposal pick-up (600 net sq. ft.); technical support area (300 net sq. ft.); and rest rooms with emergency eye wash and first aid supplies (360 net sq. ft.). Underneath the EPF, there will be a wastewater treatment facility (490 sq. ft.) for collecting and containing hazardous spills and treating contaminated water prior to discharge into the sanitary sewer. The existing facility is in non-compliance with Federal and Maryland State environmental regulations. Deficiencies include lack of secondary containment for the plating tanks, improper hazardous wastes storage areas for disposal pick-up, lack of hazardous chemical spill prevention measures, and wastewater discharges exceed the allowable Maryland State limits. The EPF is essential to permit adequate electrochemical plating support for flight programs.

2. Removal of Asbestos, Various Buildings 250,000

This project provides for the removal of asbestos from the roof deck area and the pipe chase of NASA Space Science Data Center (Building 26) and various mechanical equipment rooms in other buildings. Some of the asbestos pipe insulation and spray-applied asbestos material are damaged or flaking off.

D. Jet Propulsion Laboratory (JPL) $1,310,000

1. Cleanup of Arroyo Seco Groundwater Contamination 500,000

This project continues the multi-year effort to provide for the construction of a treatment facility to remove volatile organic compounds from the groundwater in the Arroyo Seco aquifer. Previous sampling and testing of groundwater from wells in the vicinity of JPL have confirmed the presence of trichloroethylene, carbon tetrachloride, and tetrachloroethylene, in excess of Federal and California State standards. Studies have alleged that JPL operations have contributed to the contamination. A pilot-scale treatment facility using ultraviolet radiation/ozone oxidation was constructed in FY 1987. The data generated by the pilot plant study is being incorporated into the full scale facility. Once operational, this treatment facility will provide drinking water with volatile organic compound concentrations within the Federal and California State standards for the residents of San Gabriel Valley.

2. Modify Propellant Containment Facility (Edwards Test Station, ETS) 260,000

This project provides for the construction of eight reinforced concrete containment areas for each of the existing storage facilities. This will contain any spills or leaks from stored fuels, oxidizers or other hazardous fluids which may contaminate the soil and underlying water table. This will meet Federal and California State EPA regulations for providing proper facilities to store hazardous chemicals/materials and will comply with U.S. Air Force (USAF) environmental control directives at Edwards Air Force Base.

3. Removal of Contaminated Soil (Edwards Test Station) 550,000

This project provides for the removal and cleanup of contaminated soil within six propellant test stands (A, B, C, D, E, & F) and the Thermal Treatment Facility, E-50. This is to comply with Federal and California State Department of Health Services requirements for the cleanup of the contaminated areas at ETS and ensure that the contamination does not spread beyond current property boundaries or into groundwater.

E. <u>Johnson Space Center</u> (JSC) .... <u>$1,960,000</u>

1. Cleanup of Groundwater Contaminants, Thermal Treatment Area 700,000

This project provide for the cleanup of existing contamination in the Thermal Treatment Area ('ITA) solid waste management unit where Freon 113 has been detected in the groundwater. Federal, Texas State, and Harris County EPA require that cleanup of the 'ITA contamination be initiated prior to issuing any hazardous wastes operating permit at JSC. Additional cleanup may be required.

2. Construct Photographic Waste Pretreatment System (8A) 500,000

This project provides for the installation of a waste pretreatment system for photographic bleach, developer and fixer wastewaters generated by the photographic laboratory in Building 8. The system is needed to convert hazardous wastewater containing heavy metals and hydrocarbons into hydroxide sludges and low chemical oxygen-demand effluents. The system will include three units with pumps, tanks and filters located at the photographic waste storage facility (Building 8A). This will ensure compliance with the Clean Water Act by disposing of hazardous wastewaters exceeding effluent limitations for hydrocarbons and heavy metals into surface waters and/or publicly owned treatment works.

3. Construct Plating Waste Pretreatment System (9) 300,000

The project will provide for the installation of a pretreatment system which will treat the rinse water from metal plating operations in the Technical Services Facility, Building 9. The three-stage system for converting hazardous wastewater containing heavy metals into hydroxide sludges will have the capability of mixing treatment chemicals with the rinse water, allowing it a residence time to react/settle and then providing filtering to separate the heavy metals from the water. This will comply with the Clean Water Act requirement which is to eliminate discharges of wastes containing heavy metals into surface waters and/or public owned treatment works. This pretreatment system will produce effluent of acceptable quality for discharge to the Clear Lake City Water Authority.

4. Replace and Dispose of PCB Transformers (Downey)...................................... 460,000

This project provides for the replacement of three PCB transformers and associated capacitors at the NASA Industrial Plant, Downey, Califorina (CA). There have been small leaks from these transformers and continued use presents a potential hazard to human health and the environment and possible disruption of the Plant's operation. These PCB transformers will be replaced with equivalent size non-PCB transformers.

F. Kennedy Space Center (KSC)... $1,580,000

1. Cleanup of Wilson Corners Groundwater Contamination.................................. 180,000

This project provides for continuation of cleanup of the contaminants to the surficial aquifer via the construction and operation of a groundwater/hazardous treatment system/facility. Treatment system/facility will consist of groundwater extraction wells and a pack-tower aeration treatment unit from which treated effluent will be used for land irrigation. Florida State has approved the KSC proposed cleanup methodology and has issued a binding consent order requiring compliance with completion by FY 1994. Additional funding may be required in FY 1991.

2. Cleanup of Flight Crew Rescue Training Area Contamination............................. 200,000

This project initiates the cleanup of groundwater contamination which will require the construction and operation of a treatment facility for the removal of contaminants in the groundwater. Analysis revealed trichloroethylene, trans-1,2 dichloroethane, and vinyl chloride as the major constituents of the contamination. To comply with Federal EPA and Florida State Department of Environmental Regulations, KSC is required to cleanup the contamination in the groundwater. Additional funding may be required in FY 1991.

3. Install Secondary Containment for Hazardous Waste Tanks, Various Locations............. 200,000

This project will complete the retrofit of all remaining tanks to comply with EPA regulations governing the design, installation, and use of tank systems for the storage and/or treatment of hazardous waste under the Resource Conservation and Recovery Act (RCRA). The rules require that all existing tanks and associated piping have seccndary containment with interstitial monitoring. The tanks at KSC are used to store hydrazine, nitrogen tetroxide, and freon to support critical Space Shuttle facilities such as the Orbiter Processing Facility and Pads A and B of Launch Complex (LC-39).

4. Close and Cap Ransom Road Landfill. 1,000,000

This project will properly fill, regrade and construct a multilayered cap over 10 acres of the Ransom Road landfill to prevent contamination of the area groundwater system. The landfill cap will consist of five layers including an earthen base cap, a cover/buffer cap, an impermeable synthetic membrane (polyvinyl chloride (PVC), 30 mils thick), and two addition earthen layers. A gas collection system will be incorporated into the cap, and the cap surface will be stabilized by seed and mulch. This is to comply with the approved closure plan for the landfill as required by Federal and Florida State Department of Environmental Regulations. This landfill was used for trash and other debris for approximately 15 years. During that time hazardous wastes were inadvertently disposed in the landfill. The area is closed and this project will restore the ground to its natural environment. Additional funding may be required in FY 1991.

G. <u>Langley Research Center</u> (LaRC) .... <u>$1,000,000</u>

1. Replace and Dispose of PCB Equipment, Various Locations............................... 1,000,000

This project provides for the removal and disposal of approximately 1110 PCB capacitors and replacement with non-PCB capacitors to comply with the Toxic Substances Control Act. These capacitors are located in research essential areas, such as the Advanced Technology Research Laboratory, 16' Wind Tunnel, 30'X60' Full Scale Wind Tunnel, where the possibility of rupture, fire or explosion from electrical faults presents potential hazard to human health, the environment and complete shutdown of the facility. This equipment has a high priority for replacement. In addition, there exists additional PCB equipment in other areas that will eventually require replacement.

H. <u>Lewis Research Center</u> (LeRC) .... <u>$3,000,000</u>

1. Replace and Dispose of PCB Equipment, Various Locations............................... 2,200,000

This project provides for the removal, replacement, and disposal of approximately 4,250 capacitors at Lewis Research Center. The PCB capacitors are more than 30 years old and are located at substations that supply power to critical research facilities such as the 10'X10' Wind Tunnel. These are electrical power system capacitors used to regulate distribution voltages. An explosion or fire in one of these units would contaminate the facility with PCB and result in a shutdown of operation for an indefinite period of time. In 1987, one PCB capacitor leaked and caught fire in the basement of Building 23, (Engine Research Building) requiring the building to be evacuated for four months while cleanup was being accomplished. This project will preclude this or more serious occurences from happening. Cleanup is required in accordance with the Toxic Substances Control Act. Additional replacement of PCB equipment will be required in the future.

2. Removal and Disposal of Asbestos, Various Locations.................................. 800,000

This project provides for the cleanup, removal and replacement of heavily damaged and deteriorating asbestos insulation from piping and heating, ventilation and air-conditioning (HVAC) ductwork in Buildings 3, 23, and the 10' X 10' complex. The presence and imminent release of asbestos fibers during facility rehabilitation and normal operation present a health hazard to LeRC personnel. The release of asbestos fibers constitute violations of the Clean Air Act and require remedial action.

I. <u>Marshall Space Flight Center</u> (MSFC).. <u>$3,000,000</u>

1. Cleanup of Groundwater Contamination Source, Santa Susana Field Laboratory............. 3,000,000

This project will initiate the closure of 5 hazardous waste surface impoundments at Santa Susana Field Laboratory. This Laboratory is located in Simi Hill, Ventura County, California. NASA owns approximately 460 acres of the total 2,600 acres of land at the Santa Susana complex. Through 1965-1981, NASA used these facilities to test rocket engines. During this period the waste fuel residuals were treated in surface impoundments. Subsequently, these impoundments contaminated the ground water. Results from studies have shown that heavy concentrations of trichloroethylene (TCE) exist in the groundwater system. Cleanup is required by Federal and California State regulatory compliance schedule. This involves acquiring air strippers to remove the contaminants to meet Federal and State drinking water standards. The surface impoundments are no longer used, but they must be properly closed in accordance with CERCLA and SARA. This effort is being shared by the USAF and Rockwell who also contributed to the contamination. This amount represents NASA's initial share. Additional funding may be required in the future.

J. <u>Michoud Assembly Facility</u> (MAF).. <u>$1,650,000</u>

1. Modify Chemical Waste System, Manufacturing Plant (103).............................. 700,000

The project provides for installing 2,100 ft. of an aboveground hazardous chemical waste pipeline (at 40 ft. height) with secondary containment and leak detection system to replace the underground pipeline system which is leaking. This also includes a new collection tank and sump. This will ensure the mechanical and structural integrity of the hazardous chemical waste collection system and be in compliance with the Resource Conservation and Recovery Act (RCRA) for providing secondary containment and leak detection for hazardous wastes collection systems.

2. Modify Cell "E" (110) for Waste Minimization.......... 950,000

This project provides for installing a new distribution control system, instrumentation, wiring/conduit, and monitoring points to automate Cell "E" (Building 110) operations. The existing system is out-dated and no spare parts will be available after 1992. The new system will minimize the quantity of hazardous wastes generated by liquid hydrogen/liquid oxygen (LH_2/LO_2) chemical wash processes as required by the EPA Hazardous and Solid Waste Amendments of 1984. Automation of the control system will reduce the volume of wastewater treated by MAF industrial waste treatment facility; thereby, reducing off-site sludge land disposal by approximately 4 percent and chemical usage by approximately 50 percent.

K. Stennis Space Center (SSC) $550,000

1. Retrofill PCB Transformers, Various Locations 550,000

This project provides for retrofilling 15 PCB transformers to achieve non-PCB status. The transformers are located in Buildings 3407, 1200, 2105, 3203, 2205, 2201, 3201, 2402, 3204, 8100 and 2204. Four of the PCB transformers have leaked, and all are located in or near buildings accessible to the public and/or near mission critical areas where an explosion or fire may result in shutdown of operations and costly time consuming cleanup.

L. Wallops Flight Facility (WFF) $590,000

1. Rehabilitation of Sewage Treatment Plant.................... 590,000

This project provides for the rehabilitation of the sewage treatment plant system no. 2 primary and secondary clarifiers, installation of a grit chamber, conversion to ultraviolet disinfection, miscellaneous concrete repairs and construction of gravel access roads to the drying beds and control building. The existing plant is in non-compliance with the Clean Water Act and the Commonwealth of Virginia environmental requirements for its operation. This will meet current and future operational requirements, especially for dechlorination.

M. White Sands Test Facility (WSTF) $2,700,000

1. Groundwater Contamination Assessment and Cleanup 2,500,000

This is a continuing effort to define the extent, impacts, and possible remedial approaches for groundwater and soil contamination existing at WSTF and affected offsite areas. The anticipated work for this project phase includes continued definition of offsite contamination resulting from 200/300/400/600 areas, analysis of public health risk due to offsite contamination, and defining contamination from onsite solid wastes management units. The majority of the work consists of installation of monitoring wells to define the horizontal and vertical contamination characteristics of the groundwater related soil borings, data analyses, computer modeling and engineering/chemical analysis. This effort will also provide interim measures which will be evaluated and incorporated as part of any remedial action required. Additional funding may be required.

2. Replace Underground Gasoline Tanks 200,000

This project provides for the removal of two existing deteriorated underground gasoline tanks (2,000 and 10,000 gallons) and replacing them with two aboveground tanks of equal size along with associated pumps and service station at a new location. The project also includes removal of contaminated soil to meet acceptable New Mexico State standards. This is to comply with Federal and State regulations on leaking or deteriorating underground storage tanks.

N. Various Locations $290,000

1. Remove and Dispose of Asbestos Insulation, Various Locations, Goldstone, CA.. 290,000

This project provides for the removal and disposal of approximately 17,000 sq. ft. of asbestos containing materials and replacement with environmental acceptable material in nine buildings at the Goldstone, California complex. The asbestos materials are either damaged or deteriorating and must be replaced in accordance with the Clean Air Act and Occupational Safety and Health Administration (OSHA) regulations.

MISCELLANEOUS PROJECTS LESS THAN $150,000 EACH $2,880,000

STUDIES, ASSESSMENTS, AND DESIGNS. $2,090,000

REMEDIAL INVESTIGATIONS, FEASIBILITY STUDIES, AND PRELIMINARY ENGINEERING.. .... $2,750,000

FUTURE CoF FUNDING REQUIRED TO COMPLETE THIS PROJECT:

An estimated $30,000,000 to $35,000,000 per year for the next several years will be required for continuing Environmental Compliance and Restoration projects and activities.

ADDENDUM

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

PRIVATIZATION

FISCAL YEAR 1990 ESTIMATES

SUMMARY

	Amount	Page No.
Office of Space Station:		
Construction of Neutral Buoyancy Laboratory, Johnson Space Center	30,000,000	AD 1
Construction of Space Station Processing Facility, Kennedy Space Center	43,000,000	AD 8
Office of Space Flight:		
Advanced Solid Rocket Motor Production and Test Facility, Yellow Creek, Hississippi	60,000,000	AD 18
Office of Space Science and Applications:		
Construction of Observational Instruments Laboratory, Jet Propulsion Laboratory	14,000,000	AD 24
Total	147,000,000	

PRIVATIZATION

FISCAL YEAR 1990 ESTIMATES

PROJECT TITLE: Construct Neutral Buoyancy Laboratory

INSTALLATION: Lyndon B. Johnson Space Center

Total Estimate: $30,000,000

LOCATION OF PROJECT: Houston, Harris County, Texas

COGNIZANT HEADQUARTERS OFFICE: Office of Space Station

FY 1989 AND PRIOR YEARS' FUNDING: The following prior years' funding is related to this project:

	Planning and Design	Construction	Total
Specific CoF Funding	$2,250,000	---	$2,250,000
Capitalized Investment...	---	---	---
Total...	$2,250,000	---	$2,250,000

SUMMARY PURPOSE AND SCOPE:

This project provides for the construction of a Neutral Buoyancy Laboratory (including 225 x 125 x 60 feet water tank) at the Johnson Space Center (JSC) to meet the requirements for extravehicular activity (EVA) simulations for engineering evaluations, astronaut training and EVA procedures development and validation for the Space Station era. The facility also will provide real-time mission support for anomalies during Space Station assembly and operation.

PROJECT JUSTIFICATION:

A facility is required to meet the requirements for EVA simulations for astronaut training and procedures development for assembly and support of the Space Station program. This program utilizes extravehicular activity as the baseline operational capability for structural buildup and assembly tasks. These extensive operations depend on the EVA capabilities and successful task completions. Extravehicular activities have previously been successfully developed using neutral buoyancy simulations in water tank facilities, but not of the size, complexity, and duration periods needed for the Space Station. Astronauts in space suits must be able to perform space-related EVA operations in ground based facilities in such a manner that the results will correlate closely to the actual on-orbit task performance. Existing water tank facilities were sized for earlier program requirements and are too small for the larger Space Station flight hardware assemblies. The rate of EVA development operations, astronaut training and hardware verification are increased significantly by the Space Station requirements. The Neutral Buoyancy Laboratory will accommodate the very large space hardware and will provide realistic EVA development activities and operations.

The Neutral Buoyancy Laboratory must be operational to support Space Station engineering proof-of-design concepts and validate EVA assembly task operations. Additionally, the Neutral Buoyancy Laboratory will support the Space Transportation System (STS) Orbiter astronaut tasks for Space Telescope and other STS servicing missions. It is not cost-effective to expand the size of existing facilities at JSC and MSFC, and the full scale training activities achievable in this new facility are vital to development of the Space Station.

IMPACT OF DELAY:

If this project is not approved, realistic facilities for safe effective training will not be available for Space Station assembly. Experience has clearly demonstrated that adequate neutral buoyancy simulation is required for successful EVA work performance and limiting the amount of time devoted to E A activities by the astronauts.

PROJE(DESCRIPTION:

This project provides a laboratory building of approximately 155,800 square feet (sq. ft.., constructed of steel-framing with metal siding. Inside the laboratory, a tank approximately 225 feet (ft.) long, 125 ft. wide, and 60 ft. deep and an adjacent area of 375 ft. by 175 ft. will be provided. Approximately 27,000 sq. ft. at the ends of the building will be utilized as test article mockup assembly space. The facility also will include mockup handling cranes, hyperbaric and decompression chambers, tank pumping and filter equipment, electrical power, a computer area, connection to the JSC utility control system, fire detection and suppression, lighting and heating and air-conditioning systems. Included in this facility will be a three-story technical support area approximately 30 ft. by 300 ft. housing test support rooms, laboratories, equipment storage areas and a visitors viewing area. In addition, a one-story utility support area of approximately 8,400 sq. ft. will provide space for mechanical and electrical equipment. Other construction work includes service drives, fencing, aboveground and underground utilities, main and secondary service entrances, sidewalks, an outside mockup storage area of approximately 24,000 sq. ft., a cooling tower, transformer yard, water storage tanks, parking for approximately 200 vehicles and landscaping.

PROJECT COST ESTIMATE:

Project cost estimate is based on engineering criteria and preliminary design concepts.

	Unit of Measure	Quantity	Unit cost	cost
Land Acquisition	--	--	--	--
Construction	--	--	--	$30,000,000
Site and Utilities	LS	--	--	1,500,000
Office, Laboratory, Observation, Utility Support, and High-Bay Areas	SF	155,800	71.89	11,200,000
Pool Structure	CF	1,687,500	3.79	6,400,000
Mechanical	SF	155,800	39.79	6,200,000
Electrical	SF	155,800	21.18	3,300,000
Equipment	--	--	--	1,400,000
Fallout Shelter (not feasible)	--	--	--	---
Total				$30,000,000

LIST OF RELATED GRAPHICS:

Figure 1 - Location Plan
Figure 2 - Perspective
Figure 3 - Pool Plan

OTHER EQUIPMENT SUMMARY:

Equipment valued at $800,000 will be provided from Research and Development funding.

FUTURE ESTIMATED FUNDING REQUESTED TO COMPLETE THIS PROJECT:

At the present time there are no requirements for future funding;

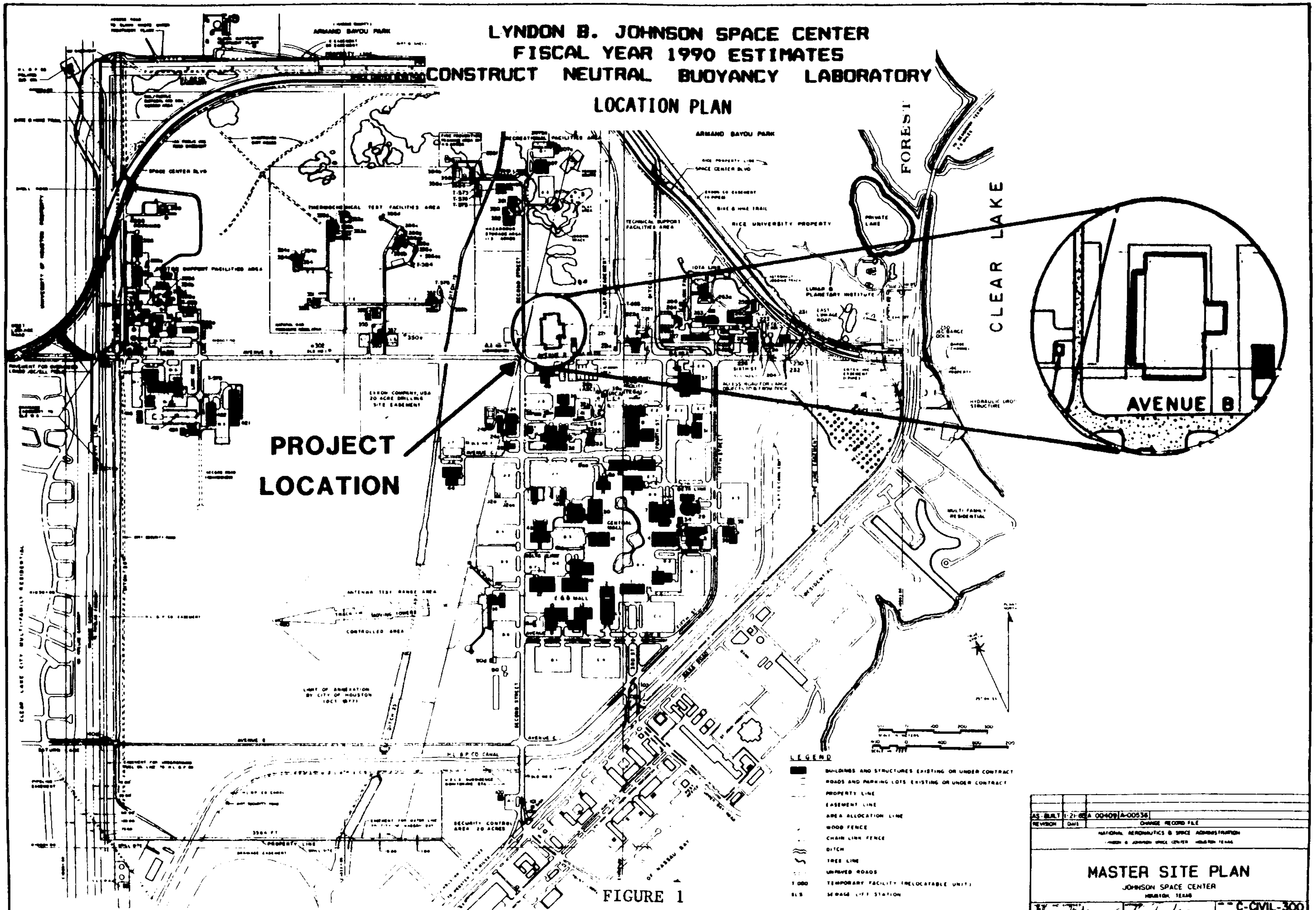

LYNDON B. JOHNSON SPACE CENTER
FISCAL YEAR 1990 ESTIMATES
CONSTRUCT NEUTRAL BUOYANCY LABORATORY
LOCATION PLAN
PROJECT LOCATION
AVENUE B
CLEAR LAKE
FOREST
MASTER SITE PLAN
JOHNSON SPACE CENTER
C-CIVIL-300

FIGURE 1

LYNDON B. JOHNSON SPACE CENTER
FISCAL YEAR 1990 ESTIMATES
CONSTRUCT NEI BUOYANCY LABORATORY

PERSPECTIVE

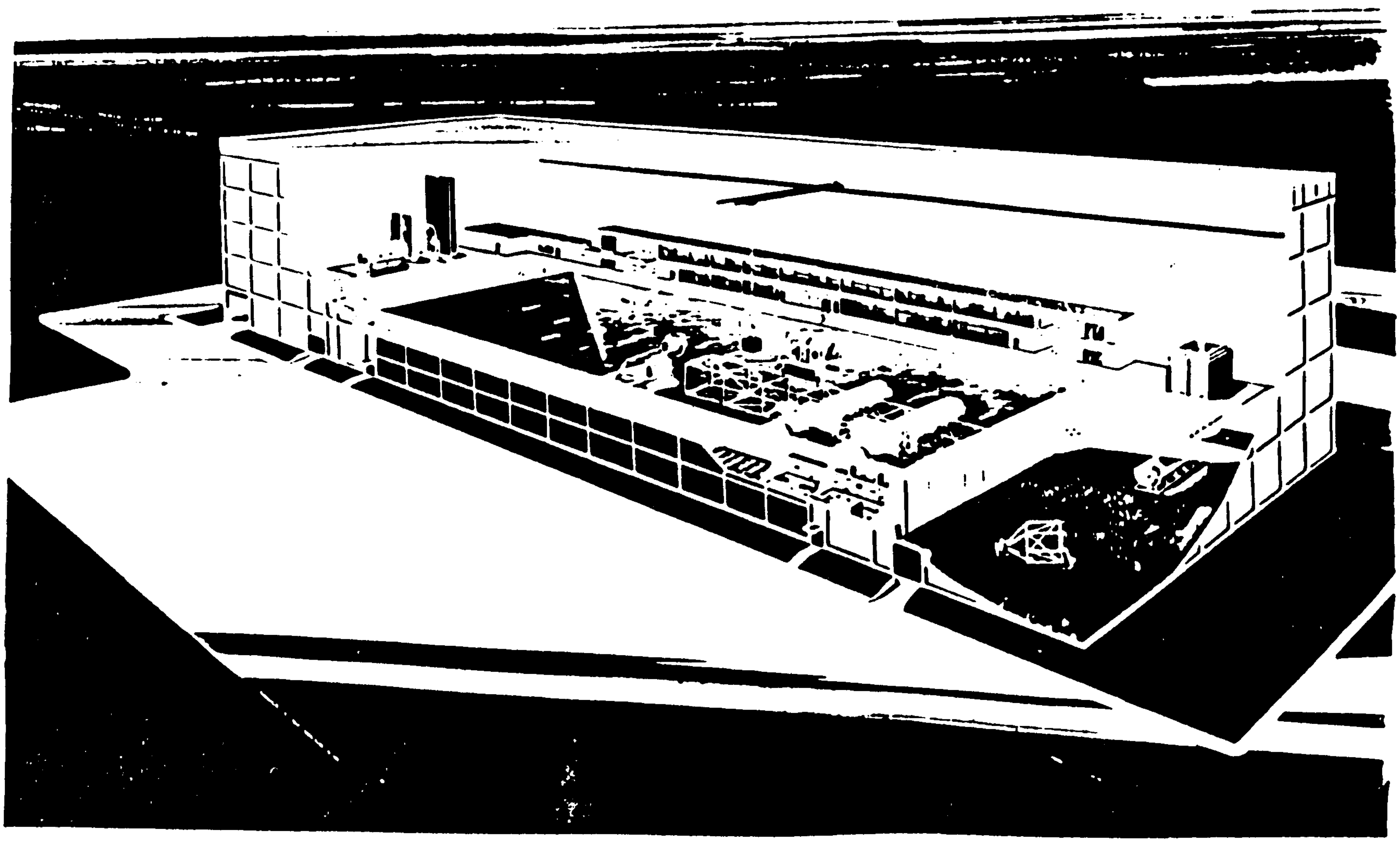
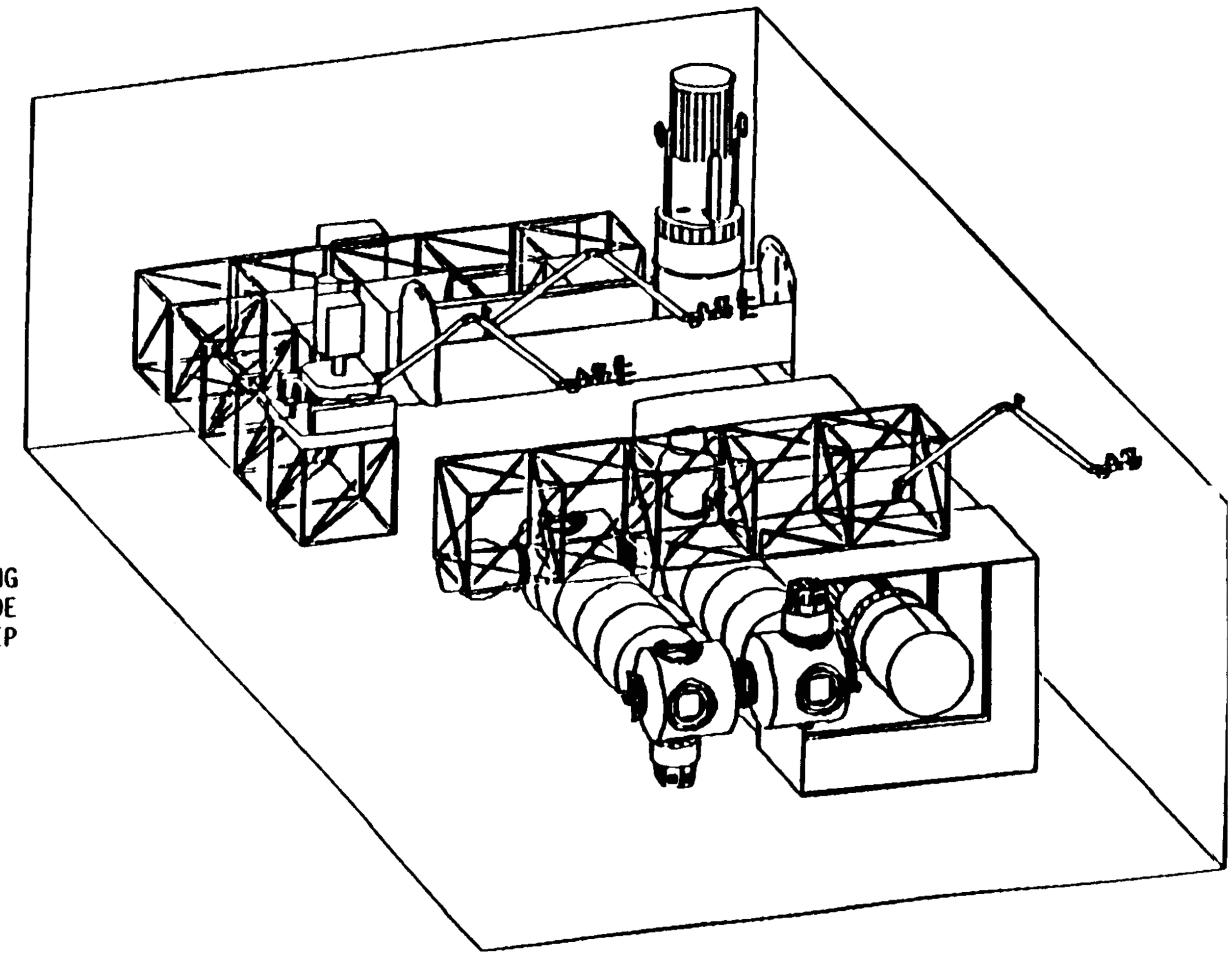


FIGURE 2

LYNDON B. JOHNSON SPACE CENTER
FISCAL YEAR 1990 ESTIMATES
CONSTRUCT NEUTRAL BUOYANCY LABORATORY

225 FEET LONG
125 FEET WIDE
60 FEET DEEP



FOUR WORK STATIONS

POOL PLAN

FIGURE 3

PRIVATIZATION

FISCAL YEAR 1990 ESTIMATES

PROJECT TITLE: Construction of Space Station Processing Facility

INSTALLATION: John F. Kennedy Space Center

Total Estimate: $84,000,000

FY 1990: $43,000,000 FY 1991: 41,000,000

LOCATION OF PROJECT: Merritt Island, Brevard County, Florida

COGNIZANT HEADQUARTERS OFFICE: Office of Space Station

FY 1989 AND PRIOR YEARS' FUNDING: The following prior years' funding is related to this project:

	Planning and Design	Construction	Total
Specific CoF Funding......................	$4,822,539	---	$4,822,539
Capitalized Investment.....................	---	---	---
Total..................................	$4,822,539	---	$4,822,539

SUMMARY PURPOSE AND SCOPE:

This project provides for construction of the Space Station Processing Facility (SSPF) for the pre-launch and post-landing nonhazardous processing of the various Space Station program elements at the Kennedy Space Center (KSC). This increment provides the site preparation and basic building structure for the high bay, airlock, intermediate bay, off-line labs, operations control area, support areas and final site work. A follow-on increment in FY 1991 will complete the facility.

PROJECT JUS ICA

Pre-launch processing is necessary to accomplish post shipment inspection and verification of Space Station elements prior to launch, to verify element-to-element interfaces, to perform final servicing and to verify on the ground, to the extent practiable, the capability of the elements and systems to function as planned in orbit. Unlike payloads/experiments aboard short duration Space Shuttle missions, Space Station elements will be in orbit for extended periods and cannot be easily or inexpensively returned to Earth for correction of system problems or malfunctions. Therefore, ground processing of Space Station elements is critical to achieving the program objectives.

Processing of elements/payloads will begin with their delivery at KSC. Elements are outfitted and assembled at the factory but final assembly, servicing, integration and verification can only be accomplished at KSC. The final processing operation will install the element in the Shuttle payload canister for transportation to the launch pad and insertion into the Orbiter's cargo bay for launch. After the Space Station becomes operational, the need for processing elements will continue as elements are returned from orbit for refurbishment, retrofitting and resupply. Both U.S. and international logistic modules will require repeated processing.

After extensive studies and analysis of the Space Station processing requirements, it was determined that the most cost-effective and efficient manner to provide nonhazardous processing of Space Station elements and their experiments was to build a new facility. Use of the existing KSC facilities, including the Operations and Checkout Building, was carefully studied and was determined not suitable due to their configurations and continuing requirements for Spacelab and other programs.

The SSPF has been sized to support the following nonhazardous processing during Space Station assembly and operational phases:

1. Initial components of the Space Station--final assembly, servicing, final tests and closeout.

2. Logistics and Resupply Operations--logistic module loading and unloading, materials handling and staging, processing and storage (minimum payload logistics associated with Space Station logistic module payload resupply only).

3. Payload Operations--off-line lab, minimal logistics, staging, storage, prelaunch integration and post-landing deintegration areas.

Location of this facility close to the existing Operations and Checkout Building will provide the opportunity for joint use of specialist checkout personnel (Figures 1 and 2).

IMPACT OF DELAY:

Space Station processing activities will be "first time" events which have historically resisted timeline compression and delay of this project will result in subsequent slippage of Space Station operations.

PROJECT DESCRIPTION:

The Space Station Processing Facility will enclose a total gross area of approximately 398,000 square feet (sq. ft.) and house a permanent staff of over 1,500 civil service, contractor, user and international personnel (Figure 3). Areas will include approximately 73,000 sq. ft. of high bay and intermediate bay floor space for parallel processing of eight Space Station (SS) elements in a class 100,000 (100K) clean, controlled environment (Figure 4). Two facility overhead cranes (30-ton, 50-foot maximum hook height) will be provided in the high bay. A 4,178-sq.-ft. air lock (class 100K clean) will provide high bay access. One 15-ton bridge crane with 45-foot hook height will span the width of the airlock.

The high bay will support module/element processing and canister/strongback operations, the intermediate bay will provide rack and experiment processing areas. The processing areas will be provided with compressed air and vacuum systems, gaseous nitrogen and gaseous helium (GN_2 and GH_e) distribution systems, gaseous vent systems for ammonia, high pressure general purpose and pressure experimental applications vent systems, and an ultraviolet/infrared (UV/IR) fire detection system.

The three-story off-line support area will contain approximately 320,000 sq. ft. of operational area (Figure 4). Areas within the support area include 9,532 sq. ft. for customer support; 6,772 sq. ft. for international support; and area for off-line laboratories and experiment, payload and rack testing. The remaining space includes operations support areas for schedule and quality control (QC) rooms, shop supervision, documentation and control room areas, laboratories and office space. Also included are various common support areas such as mechanical/electrical equipment rooms, electrical communication rooms, cafeteria, rest rooms, elevators, stairwells and corridors.

This increment will include general site work and site utilities, the building foundations, floor slabs, structural steel, roofing, exterior walls, and long lead mechanical and electrical equipment. Site work will include construction of storm drains and GN_2 mains and other mechanical utilities; sanitary, firex and potable water will be tied into existing utilities. The power and communications duct banks will also be constructed.

The follow-on increment of funding includes mechanical and electrical distribution systems, architectural systems and landscaping and parking. Emphasis will be placed on specialized areas to ensure their earlier completion and activation.

PROJECT COST ESTIMATE:

The basis of this cost estimate is Facility Studies and Preliminary Engineering Report (PER).

	Unit of Measure	Quantity	Unit cost	cost
Land Acquisition	---	---	---	---
Construction	---	---	---	$43,000,000
Site Preparation	LS	---	---	5,288,000
Architectural/Structural	SF	398,000	52.76	20,997,000
Mechanical	SF	398,000	30.43	12,114,000
Electrical	SF	398,000	10.30	4,100,000
Mechanical Utilities (GN_2)	LS	---	---	176,000
Environmental Support Systems	LS	---	---	93,000
Communications	LF	1,000	232.00	232,000
Equipment	---	---	---	---
Fallout Shelter (not feasible)	---	---	---	---
Total				$43,000,000

LIST OF RELATED GRAPHICS:

Figure 1 - Location Plan
Figure 2 - Site Plan
Figure 3 - Perspective
Figure 4 - Plan View - First Floor

OTHER EQUIPMENT SUMMARY:

Certain noncollateral equipment to be funded from Research and Development (R&D) resources and estimated to cost $317.8 million will be required to support initial SSPF operations.

FUTURE FUNDING REQUIRED TO COMPLETE THIS PROJECT:

A follow-on increment costing approximately $41,000,000 will complete the project.

JOHN F. KENNEDY SPACE CENTER
FISCAL YEAR 1990 ESTIMATES
CONSTRUCTION OF SPACE STATION PROCESSING FACILITY
LOCATION PLAN

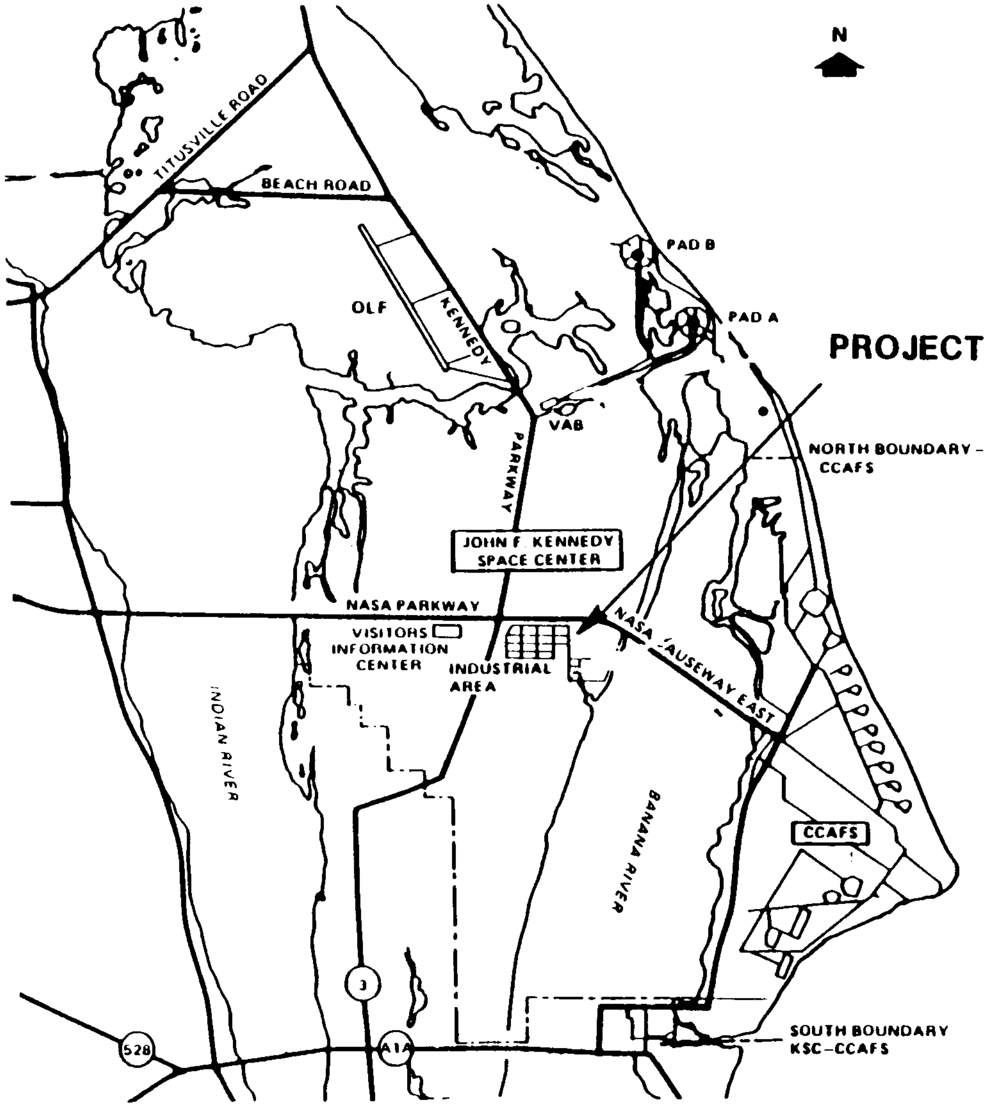


FIGURE 1

JOHN F. KENNEDY SPACE CENTER
FISCAL YEAR 1990 ESTIMATES
CONSTRUCTION OF SPACE STATION PROCESSING FACILITY
SITE PLAN

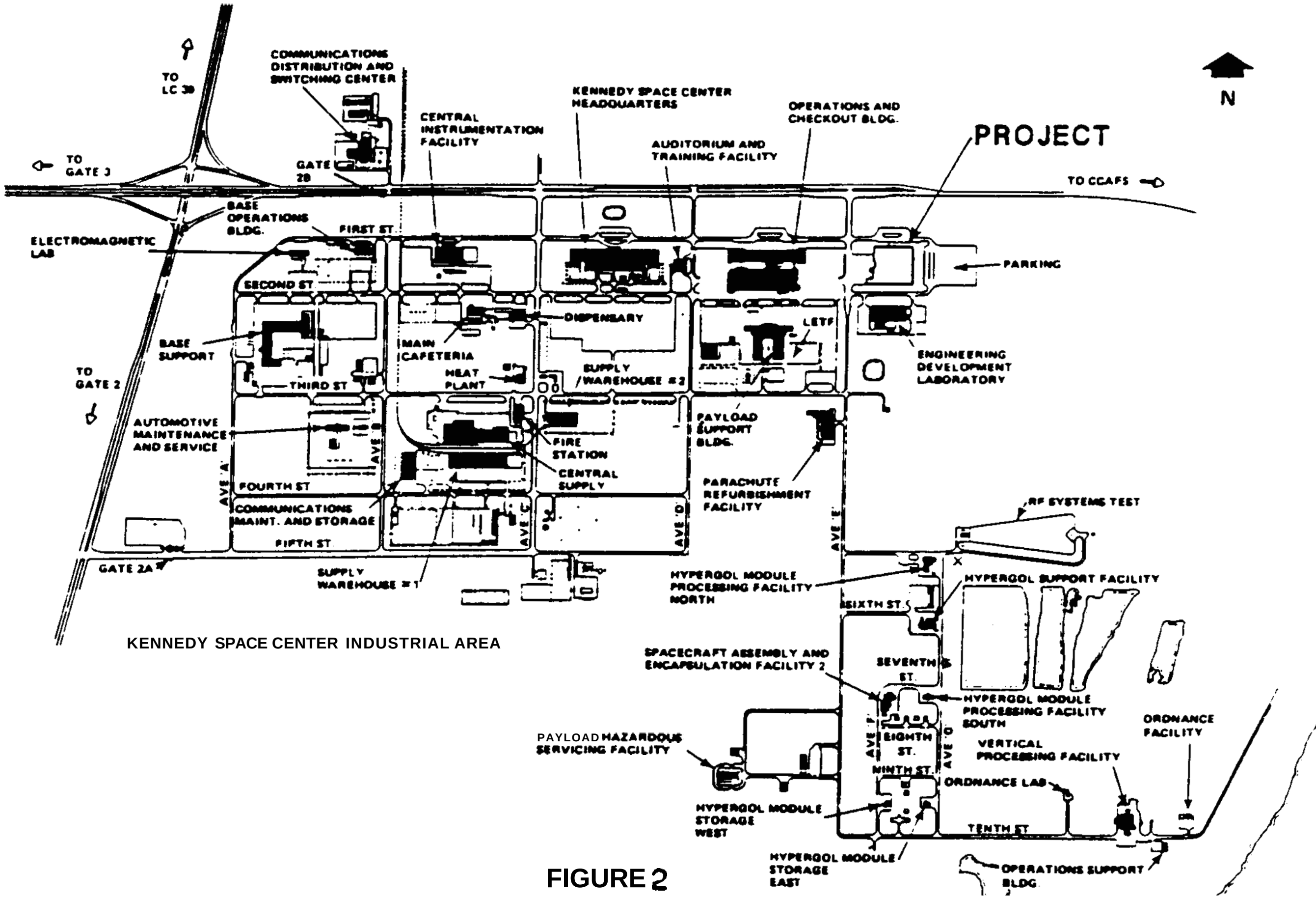


FIGURE 2

JOHN F. KENNEDY SPACE CENTER
FISCAL YEAR 1990 ESTIMATES
CONSTRUCTION OF SPACE STATION PROCESSING FACILITY

PERSPECTIVE

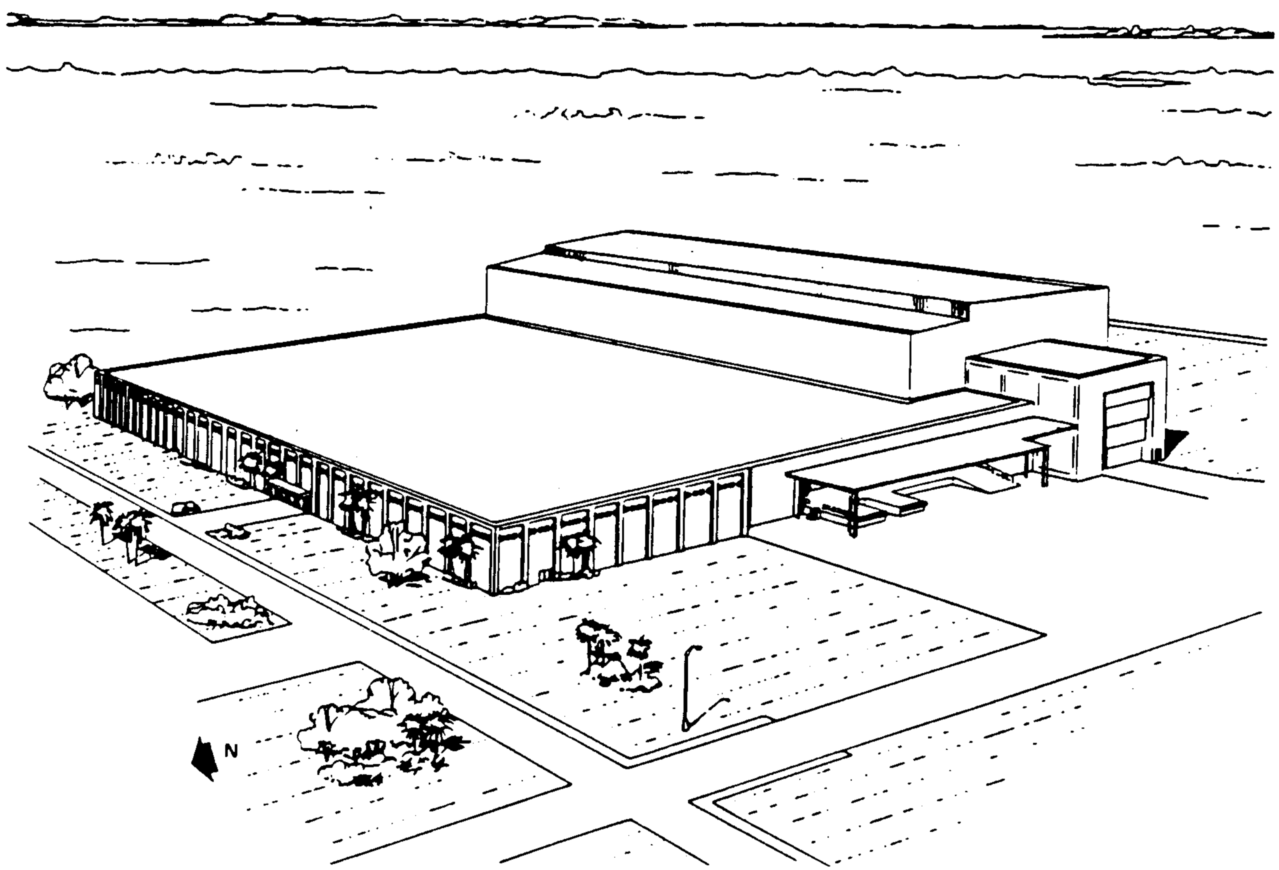


FIGURE 3

JOHN F. KENNEDY SPACE CENTER
FISCAL YEAR 1990 ESTIMATES
CONSTRUCTION OF SPACE STATION PROCESSING FACILITY

PLAN VIEW-FIRST FLOCR

4
M

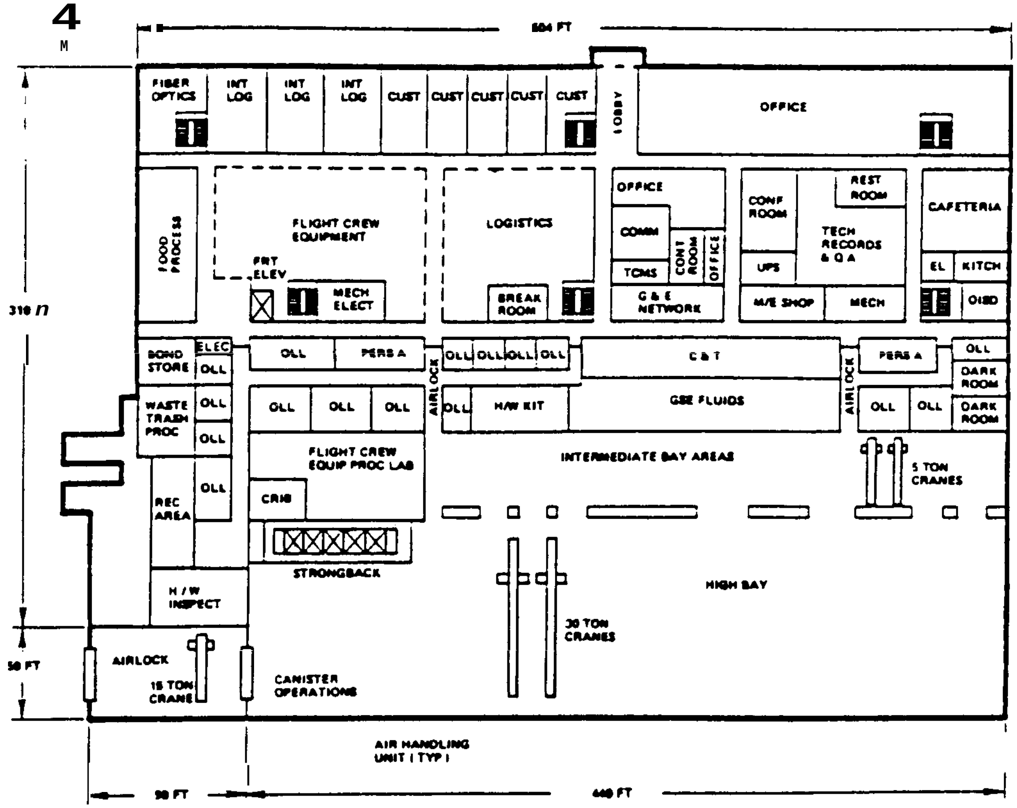


FIGURE 4

JOHN F. KENNEDY SPACE CENTER
FISCAL YEAR 1990 ESTIMATES
CONSTRUCTION OF SPACE STATION PROCESSING FACILITY

PLAN VIEW-SECOND FLOOR

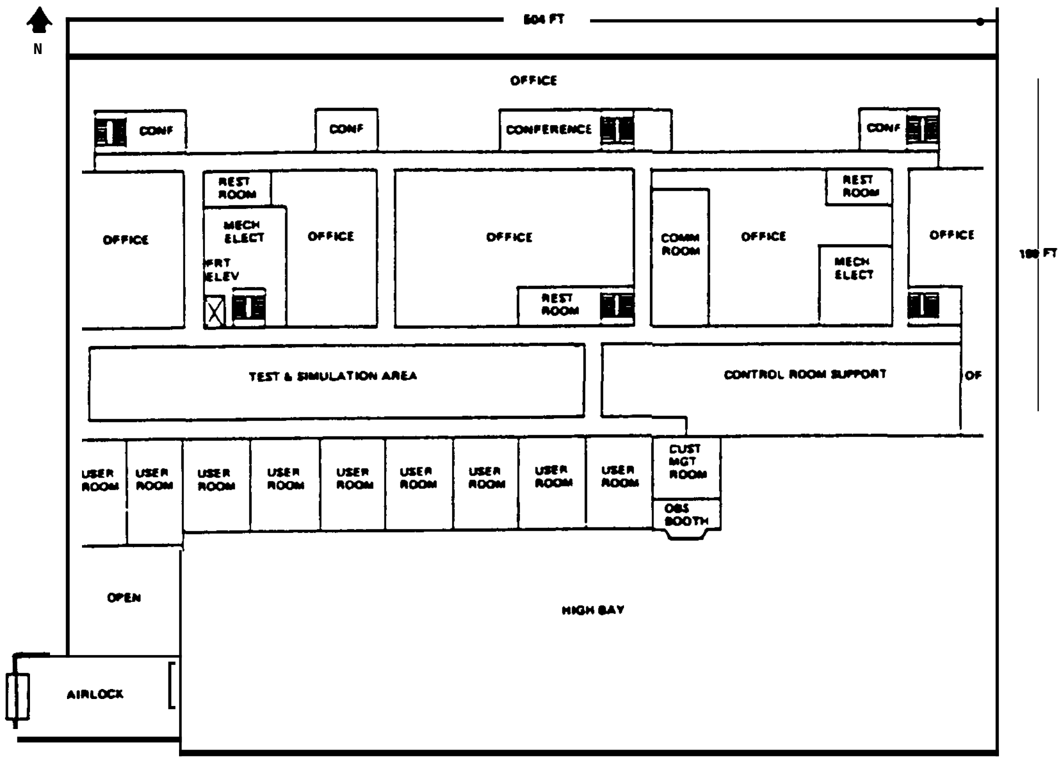


FIGURE 5

PRIVATIZATION

FISCAL YEAR 1990 ESTIMATES

PROJECT TITLE: Construction of Advanced Solid Rocket Motor Production and Test Facility

INSTALLATION: Various

Total Estimate: $300,000,000

FY 1990: $60,000,000; FY 1991: $93,000,000; FY 1992: 120,000,000

LOCATION OF PROJECT: Various Locations

COGNIZANT HEADQUARTERS OFFICE: Office of Space Flight

FY 1989 AND PRIOR YEARS' FUNDING: The following prior years' funding is related to this project:

	Planning and Design	Construction	Total
Specific CoF Funding.....................	$13,000,000	$14,000,000	$27,000,000
Capitalized Investment....................	---	---	---
Total..................................	$13,000,000	$14,000,000	$27,000,000

SUMMARY PURPOSE AND SCOPE:

This project provides for construction of the new Advanced Solid Rocket Motor (ASRM) Production and Test Facilities and the acquisition of the Yellow Creek site from the Tennessee Valley Authority (TVA). Acquisition of the land will be from FY 1989 funds appropriated for this project. ASRM is needed to recover lost payload lift, added mission capability and improve margins of safety and reliability of the Space Transportation System. The Yellow Creek site in Northeastern Mississippi has been tentatively selected as the Government site for the production facilities and Stennis Space Center has been tentatively selected as the Government site for the testing facilities. Final site approval and acquisition will not be made until after an Environmental Impact

Statement (EIS) has been completed. Each ASRM contractor proposal includes a private financing option and this FY 1990 CoF budget submission assumes that this option will be selected.

PROJECT JUSTIFICATION:

The NASA Authorization Act of 1988 (PL 100-141, October 30, 1987, Section 121) indicated that the Solid Rocket Motor (SRM) Project of the Space Shuttle Program would benefit from competition and directed issuance of an (RFP) for an ASRM. This ASRM will significantly improve the safety and reliability margins of the SRM by better ballistic design to reduce or eliminate about 175 critical failure modes. It also will provide the Shuttle with a significant gain in performance by providing an additional 12,000 pounds of payload capability. Moreover, development of the ASRM will establish a strong technical foundation upon which U.S. leadership in the highly competitive field of solid fueled rockets can be maintained.

Production of the ASRM will require modern and automated facilities with greatly improved manufacturing and quality control processes. The facilities will be designed to produce 16 flight sets of ASRM's per year to ensure meeting Shuttle launch rates. The new plant will incorporate state-of-the-art computer controlled manufacturing and assembly techniques to enhance the reliability and safety margins of the motor. The present manufacturing process is a labor-intensive process with many opportunities for human error and requires additional inspection effort to ensure achievement of required quality standards. The advanced motor will have a segmented joint configuration which provides better maintainability and lesser risk of failure.

IMPACT OF DELAY:

Delay of this project will have corresponding impact on the ability of the Space Transportation System to fulfill requirements for increased payload performance and reliability. The added performance of the ASRM will be equivalent to an additional 2.4 Shuttle missions per year, resulting in a simple payback of the investment cost in less than five years.

PROJECT DESCRIPTION:

The ASRM acquisition plan recognizes that the production plant is highly dependent on ASRM design features. Accordingly, the contract for design, development, test and evaluation (DDT&E) includes the design and construction of the necessary production and test facilities. This will shorten the time needed to complete the plant and to maximize coordination between motor design and facility design.

The first increment of construction scheduled for FY 1989, depending on location, will include site preparation and development and start of facilities construction. This increment also provides for the design of the facilities. As a result of the acquisition methodology, detailed facilities development schedules for FY 1990 through 1992 will not be available until a contractor is selected. Contractor proposals are under evaluation by a NASA Source Evaluation Board, with contractor selection scheduled for late spring or summer 1989.

The total facility construction program is phased over four fiscal years and will include manufacturing buildings; test stands; control, instrumentation and data acquisition systems; peripheral equipment and support facilities. All potential offerers have teamed with Architectural/Engineering (A/E) firms and it is expected that each will propose to use a design/build approach for facilities construction. Functions to be included in the total ASRM production and test facilities include:

Production Facilities - Case Refurbishment/Preparation, Nozzle Manufacturing/Refurbishment, Aluminium (AL) & Ammonium Perchlorate (AP) Storage, Oxidizer Preparation, Premix, Propellent Mixing, Cast/Cure, Core Strip/Trim, Tool Cleaning, Final Assembly, Non-destructive Evaluation and Static Test.

Support Facilities - Engineering & Administration, Research & Development, Security, Fire Station/Dispensary, Cafeteria & Training, Hazardous Waste Storage, Waste Treatment, Sewage Treatment, Water Treatment, Laboratory, Metrology, Component Testing, Chemical Laboratory, Central Warehouse, Inert Materials Storage, Base Maintenance/Custodial, Operations and Maintenance, Safe Haven Shelters, Motor Surge, Communications, Meteorology, Motor Shipping/Receiving, Barge Loading, Motor Pool, Power Station, Boiler/Chilled Water Plant and a Control Bunker.

FY 1990 PROJECT COST ESTIMATE:

This cost estimate is based on a concepts study.

	Unit of Measure	Quantity	Unit cost	cost
Construction....................................	---	---	---	$60,000,000
Site Work and Utilities........................	LS	---	---	(11,000,000)
Construction (Includes Design).................. (i.e., Start Construction on Key Support and Production Facilities)	LS	---	---	(49,000,000)
Equipment......................................	---	---	---	---
Fallout Shelter (not feasible)....................	---	---	---	---
Total............................				$60,000,000

NOTE: This cost estimate provides the FY 1990 increment of the total facilities. The total cost to complete the project is estimated to be approximately $300 million.

LIST OF RELATED GRAPHICS:

Figure 1 - Location Plan
Figure 2 - Site Plan

OTHER EQUIPMENT SUMMARY:

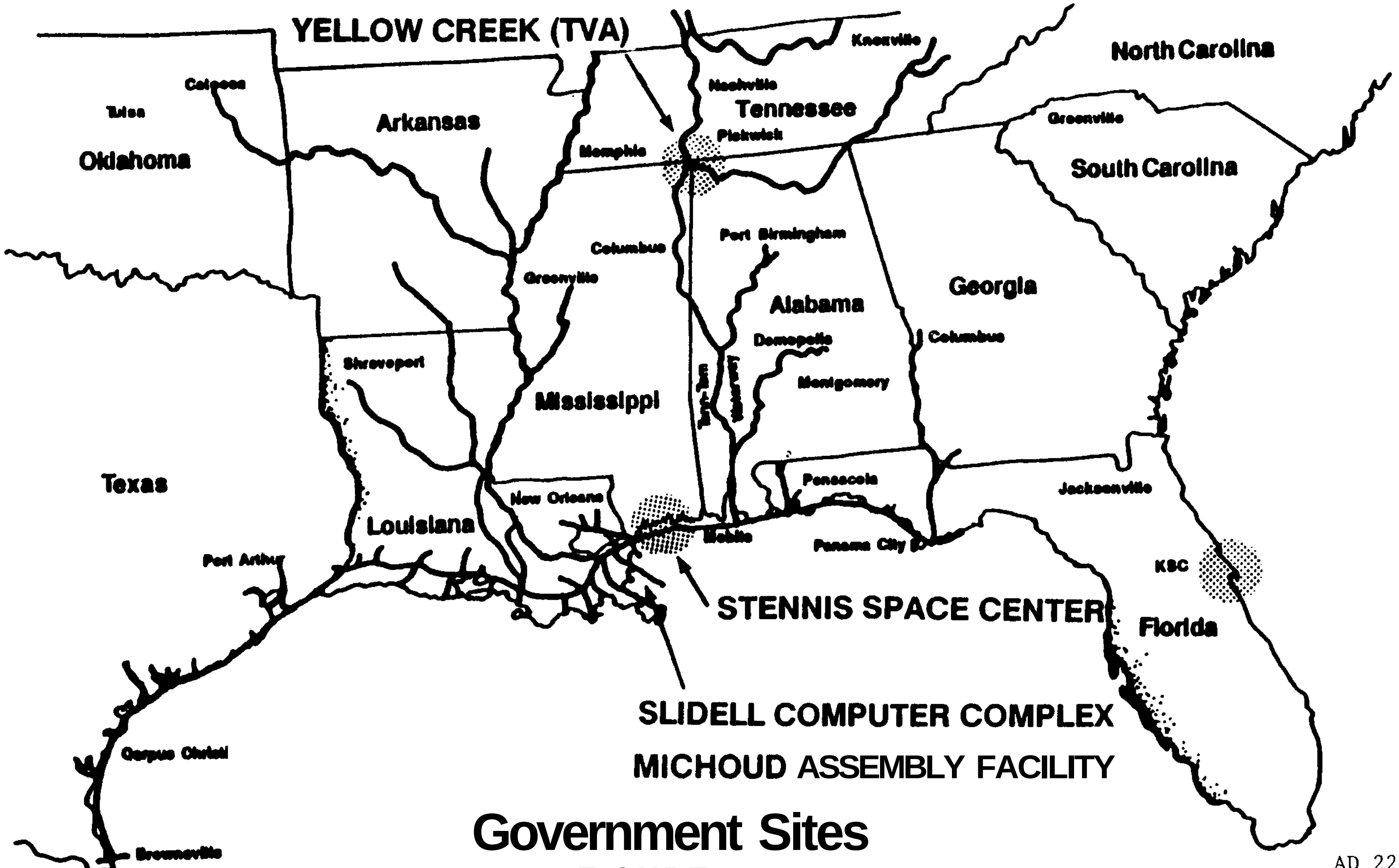
Certain noncollateral equipment to be funded from R&D resources and estimated to cost $250 million will be required to support initial ASRM operations.

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

This project is currently expected to be totally funded, except for land acquisition, using the private financing option contained in the Request for Proposal (RFP).

VARIOUS LOCATIONS
FISCAL YEAR 1990
CONSTRUCTION OF ADVANCED SOLID ROCKET MOTOR PRODUCTION AND TEST FACILITY

LOCATION PIAN



Government Sites

FIGURE 1

VARIOUS LOCATIONS
FISCAL YEAR 1990

CONSTRUCTION OF ADVANCED SOLID ROCKET MOTOR PRODUCTION AND TEST FACILITY

SITE PLAN

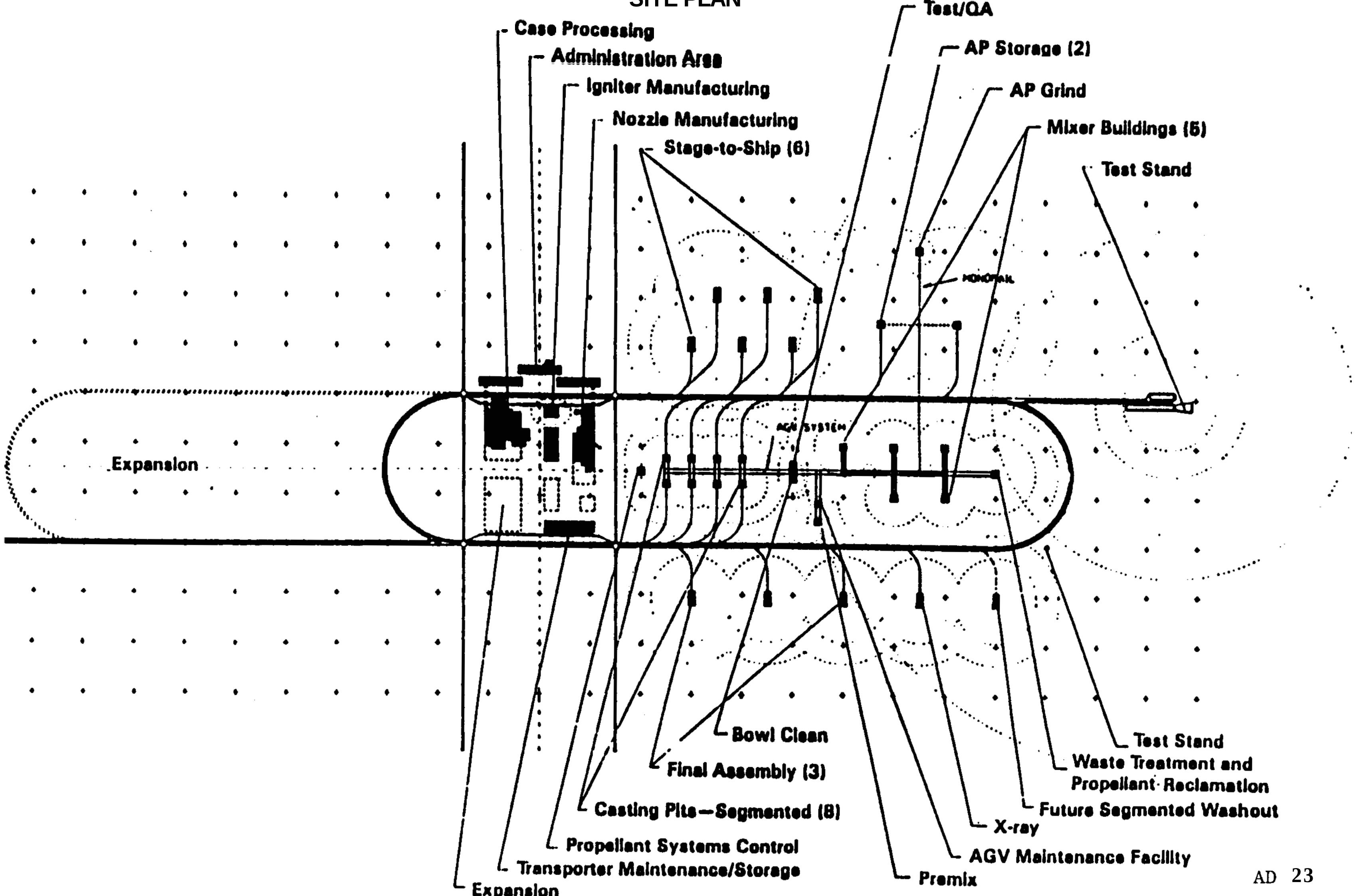


FIGURE 2

PRIVATIZATION

FISCAL YEAR 1990 ESTIMATES

PROJECT TITLE: Construction of Observational Instruments Laboratory

INSTALLATION: Jet Propulsion Laboratory

Total Estimate: $14,000,000

LOCATION OF PROJECT: La Canada-Flintridge, Los Angeles County, California

COGNIZANT HEADQUARTERS OFFICE: Office of Space Science and Applications

FY 1989 AND PRIOR YEARS' FUNDING: The following prior years' funding is related to this project:

	Planning and Design	Construction	Total
Specific CoF funding.....................	$990,000	---	$990,000
Capitalized investment....................	---	---	---
Total.................................	$990,000	---	$990,000

SUMMARY PURPOSE AND SCOPE:

This project provides for the construction of a multistory 80,000-square-foot laboratory. A controlled environment for assembly, research, and testing of instruments from 1 to over 100 cubic feet and weighing up to 600 pounds will be provided. The Jet Propulsion Laboratory (JPL) is responsible for the development of instruments used in the Earth Surface, Earth Atmosphere, Planetary Exploration and Astrophysics Programs. The present facilities were not designed for the necessary controlled conditions, size or increased number of future space instruments. It is imperative that this facility meet the increased area and environmental requirements for future programs.

PROJECT JUSTIFICATION:

The significant growth of observational instruments over the next few years will require a new facility. This facility must house imaging systems, infrared and analytical instruments, microwave observational systems and optical science and applications development activities. It must provide the capability to develop observational instruments operating throughout the electromagnetic spectrum. Such instruments require stringent procedural controls as well as control of temperature, humidity, and particulate contamination during manufacture, assembly, test, and calibration.

In addition the number of instruments requiring processing is increasing steadily. Currently, approximately 10 instruments are in some phase of development and testing. The number is expected to reach more than 20 or more in the 1990's. Also, there is an increase in the size of the instruments e.g., weight, volume, power, data, cost. Current instruments weigh around 30 pounds and occupy about 2 cubic feet. The future instruments will weigh around 600 pounds and occupy 100 cubic feet. The general growth in physical size precludes the use of existing facilities. The larger instruments will require cranes, and vehicle transporters, which require a facility with vertical and horizontal clearances for this equipment. Also, instruments are becoming increasingly sensitive and will require improved contamination, temperature and humidity control. Future instruments will need an adequate and safe processing facility which presently does not exist at JPL.

IMPACT OF DELAY:

A delay in the construction of the Observational Instruments Laboratory will force continued use of substandard facilities and a re-evaluation of the size and type of instruments that can be developed and processed at JPL. The instrument development work to be performed in the 1990's would be delayed, ultimately affecting science and applications flights into the next century.

PROJECT DESCRIPTION:

This project will provide for construction of an approximately 80,000-gross-square-foot steel frame building on an open site in the southern sector of JPL, east of Surveyor Road, and south of the Robotics Laboratory, Building 278. The building will include a high-bay assembly area, class 10,000 clean rooms, electronic and optical laboratories necessary for assembly, testing, and calibration, an atmospheric observation laboratory on the roof, and essential support space. The building will be environmentally controlled and fire sprinkled. The clean room ventilation systems will be separate from the central system. Compressed air, gaseous nitrogen, central vacuum systems, liquid nitrogen, and deionized water will be provided. The building electrical systems will include a 480 V and 208 V power distribution system. Grounding will consist of four individual systems: the power system ground, personnel safety equipment ground, electrostatic control ground, and signal reference ground. The communications systems will include fire detection, telephone, utility control, local area networking, and a hardwired instrumentation system. A central plant will be located adjacent to the structure to accommodate two chillers with cooling towers and pumps with a total capacity of 530 tons, liquid and gaseous nitrogen storage tanks, and laboratory vacuum and compressed air pumps.

PROJECT COST ESTIMATE:

This cost estimate is based on a preliminary engineering report.

	Unit of Measure	Quantity	Unit cost	Total Cost
Land Acquisition..................................	---	---	---	---
Construction..................................	---	---	---	$14,000,000
Site work..................................	LS	---	---	1,600,000
Architectural/structural..................................	SF	80,000	80.00	6,400,000
Mechanical..................................	SF	80,000	45.00	3,600,000
Electrical..................................	SF	80,000	30.00	2,400,000
Equipment..................................	---	---	---	---
Total..................................				$14,000,000

LIST OF RELATED GRAPHICS:

Figure 1 - Location Plan
Figure 2 - Project Rendering
Figure 3 - Typical Floor Plan

OTHER EQUIPMENT SUMMARY:

Approximately $7,000,000 of R&D-funded equipment, including a veiling glare and scatter light facility and collimator, will be required.

FUTURE ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

No additional facilities funding is anticipated.

JET PROPULSION LABORATORY
FISCAL YEAR 1990 ESTIMATES
CONSTRUCTION OF OBSERVATIONAL INSTRUMENTS LABORATORY
LOCATION PLAN

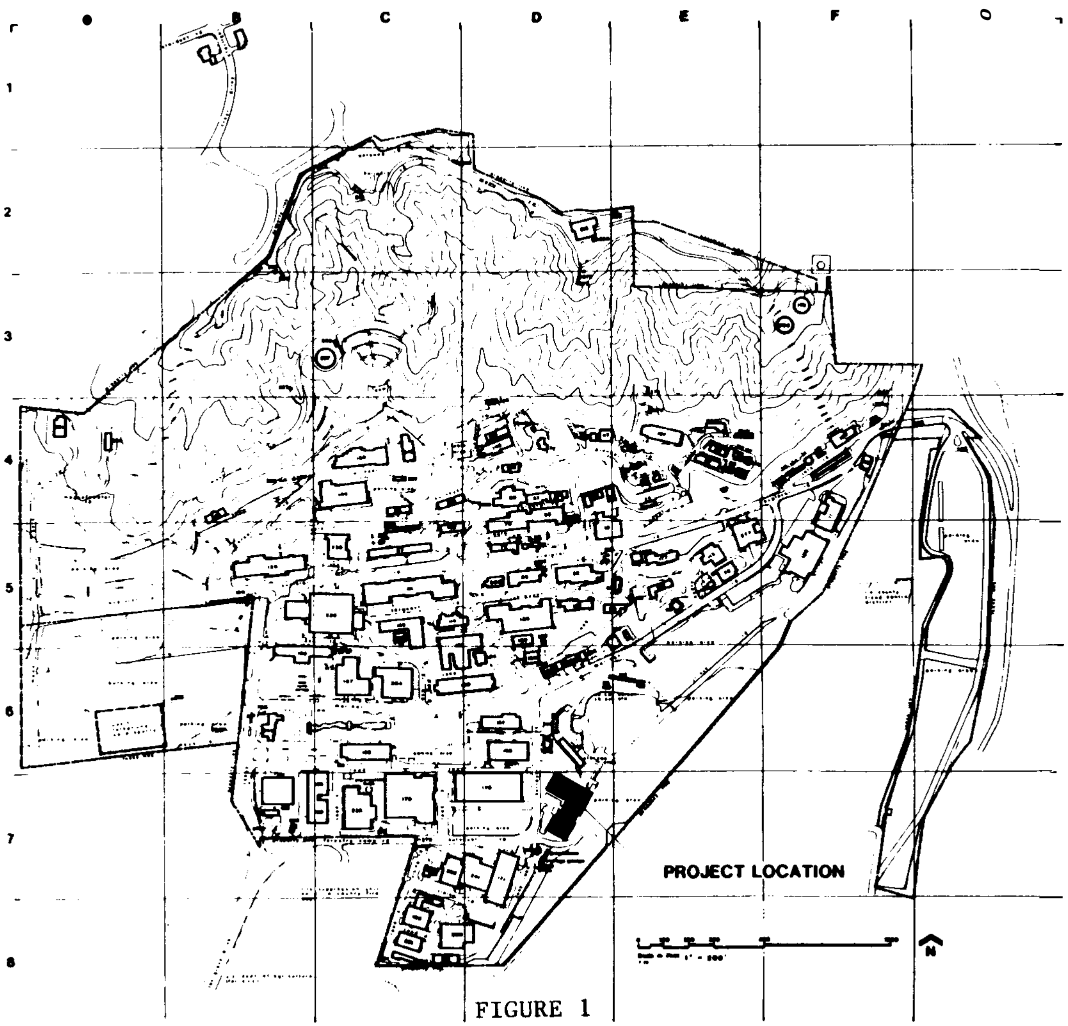


FIGURE 1

JET PROPULSION LABORATORY
FISCAL YEAR 1990 ESTIMATES
CONSTRUCTION OF OBSERVATIONAL INSTRUMENTS LABORATORY
PROJECT RENDERING

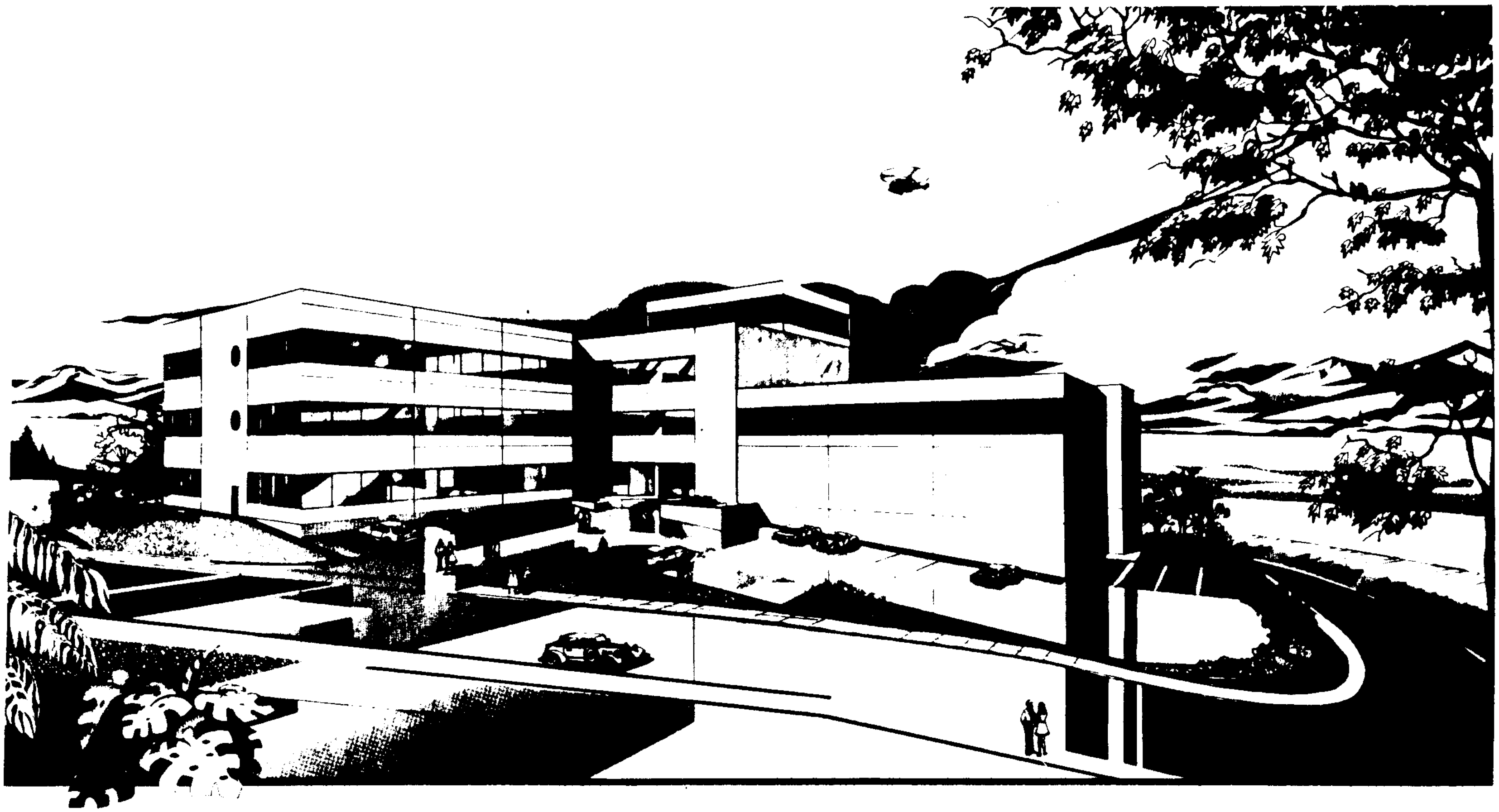


FIGURE 2

JET PROPULSION LABORATORY
FISCAL YEAR 1990 ESTIMATES
CONSTRUCTION OF OBSERVATIONAL INSTRUMENTS LABORATORY
TYPICAL FLOOR PLAN

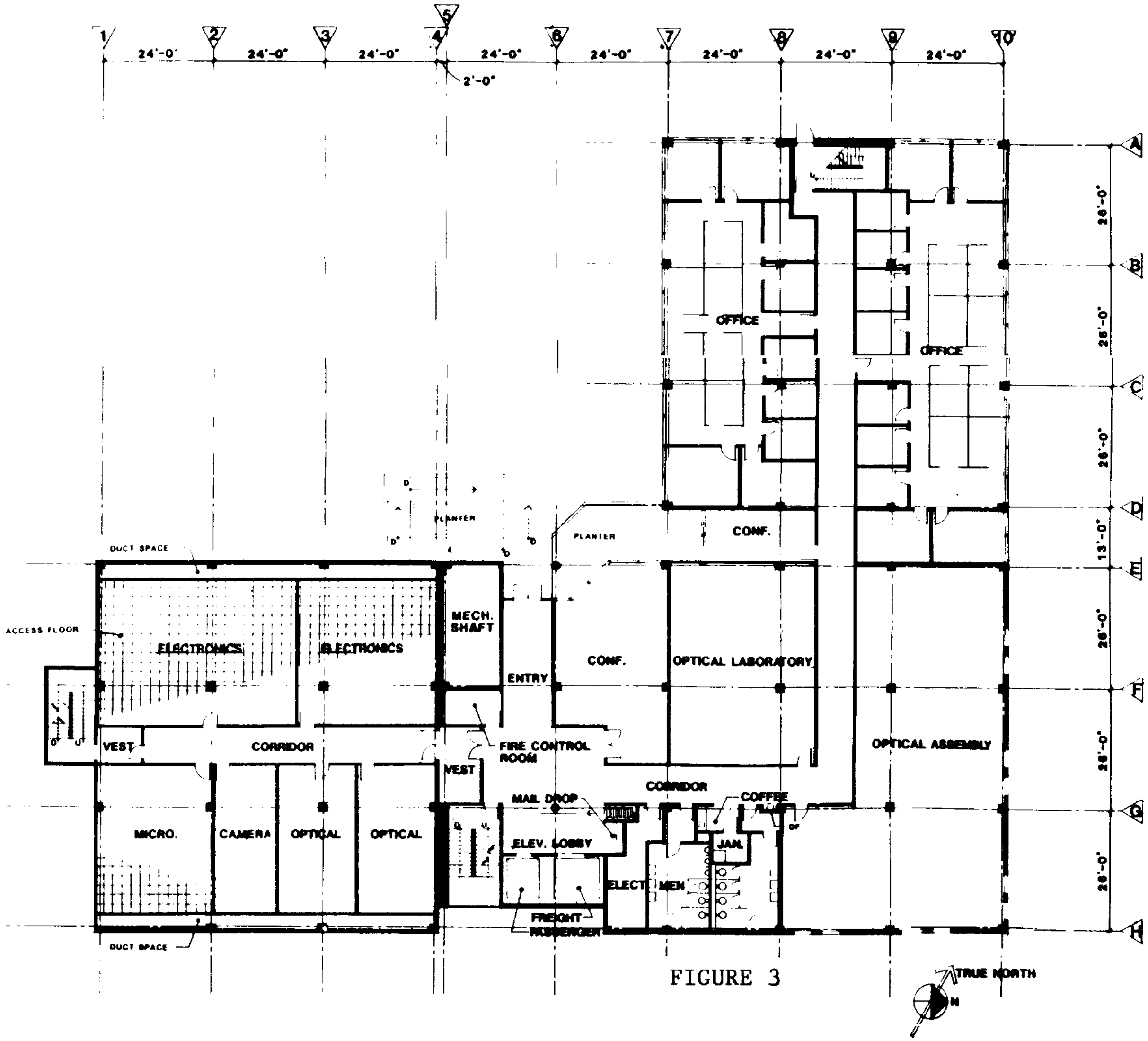


FIGURE 3